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Discovery and Invention and the Lighting Industry

IN a recent contribution to *The Daily Express* Sir Herbert Morgan emphasized a point that, even to-day, is not sufficiently realized—the dominant part played by applied science and inventions in promoting industrial prosperity. The soundest cure for unemployment is to sell more goods abroad. But it cannot be ignored that many of the countries to whom we formerly exported goods are now producing for themselves what they once bought from us. Our best hope of getting new business, therefore, is to produce something new and distinctive—something of unquestionable utility which others cannot give. "It is easy to get orders by cutting prices; but to continue to produce without a satisfactory profit can only lead to bankruptcy. We can give good value by virtue of the merit of an idea, invention or design, or by economical and large-scale production. Leadership is wanted in both cases." People, Sir Herbert continued, are inclined to think in terms of iron, steel, coal and cotton. The value of the proprietary article has not been sufficiently realized; yet the proprietary article is the spearhead of British commerce.

The same idea was conveyed in the recent Presidential Address of Sir William Bragg to the British Association on "Science and Craftsmanship." He pointed out how the discoveries of such men as James Watt and Michael Faraday have resulted in the development of new industries; how in recent years yet newer industries, such as those associated with motoring and aerial navigation and the production of artificial silk, have been essential results of scientific discovery. There is no end to these possibilities. The historian of the future, surveying the years following the Great War, will no doubt trace the remarkable recuperation of all the nations concerned largely to the influence of scientific discovery, the commercial exploitation of which is proceeding at a continually increasing rate.

These considerations have, we think, a special bearing on the lighting industry. Readers of Colonel Crompton's "Reminiscences" will see the same process at work, the great impetus to industry and employment given by the discovery of the electric lamp in 1880. Subsequent discoveries in the lighting field, while less epoch-making than those of Edison and Swan, have each contributed to industrial progress. Probably few laymen realize the vast dimensions assumed by the electric-lamp industry within recent years, and the continual expansion of factories to supply the supplementary lighting equipment. Here, indeed, we have what is essentially a new industry. Even in the latter years of the last century the number of firms engaged on the production of lighting equipment was limited, and their output relatively small. Since 1900 the variety of globes, shades and reflectors, and other devices for applying light in the service of mankind has multiplied exceedingly. Each application of light, whether in the home or the factory, on the railway, on the stage, or at the aerodrome, demands special equipment. It is this increase in knowledge how best to *apply* artificial light that is mainly responsible for the great growth of the lighting industry during recent years.

It may be that in years to come there will be entirely new discoveries in the lighting field—methods of producing light vastly more efficient than those available to-day—and we know that our present illuminants, though far more efficient than those of the past, still furnish only a small fraction of the energy supplied to them in the form of light. Another possible direction of progress is in our methods of controlling *quality* of light. Colour continues to play an increasing part in lighting schemes. Within the last few years attention has been concentrated on the applications of invisible portions of the spectrum, both for industrial and medical use. A day may come when we shall be able not only to produce at will the intensity of light we desire but also to furnish energy from the region of the spectrum desired for some special purpose, *and this radiation only*. This again would have a most important bearing on the "efficiency" of illuminating engineering. But it is mainly in the direction of greater skill in the design of apparatus for applying light that we look for immediate progress.

The lighting industry itself has become an exceedingly extensive and important one. But who can measure the benefits that it has conferred on other industries? The great part played by light in industry is being illustrated by the campaign for better factory lighting now in progress.

Can one think of any single agent which has done more to assist national production than illumination? Yet this is only a small part of the services which light performs. It is indispensable for practically every form of occupation, an important element in our home life and in modern recreation. Lighting is, indeed, one of the "key industries" to-day.

The International Illumination Congress in the United States

AT the opening meeting of the Illuminating Engineering Society, on November 6th, by which time the delegates to the International Illumination Congress in the U.S.A. will have returned, we look forward to hearing something of their experiences. Meantime information already received fully bears out the impression that this would be one of the most important conferences on illumination on record, and delegates appear to have enjoyed an unprecedented opportunity of learning of developments in illumination all over the world.

Readers will recall that the proceedings included three distinct items—the tour of leading American cities, the Convention of the Illuminating Engineering Society (U.S.A.) in Toronto, and the session of the International Illumination Commission held at Saranac, N.Y. We understand that more than one hundred delegates and representatives from France, Great Britain, Germany, Austria, Holland, Japan, Sweden, Switzerland, Brazil, and the United States took part. The papers, reports and communications presented at these gatherings were very numerous—we have already before us nearly a hundred—and covered a very wide field indeed. Taken in the mass, they reveal very strikingly how the subject of illuminating engineering is continually extending, and how scientific knowledge and skill in applying artificial light are developing side by side. We hope to give some idea of their contents in our next issues.

Apart from this mass of technical data, the impressions of visitors during the various tours should prove most interesting. Places visited included the Lighting Institution at Harrison, the Edison Laboratory at West Orange, and Coney Island. Visitors must also have gained much interesting information regarding methods of propaganda in leading American cities, where developments in lighting have been phenomenally rapid. According to accounts received, the arrangements for all these visits were remarkably efficient—a tribute to the organizing powers of Mr. George Merrill, the chairman of the Tour Committees, and his assistants. The arrangement by which each delegate received a leather-bound book, engraved with his name, and within a full account of the daily arrangements, was a happy thought. It must have been an interesting experience to visit in turn the chief centres of illumination and to study the methods employed.

Above all the Congress has afforded a unique opportunity for those interested in illumination in different lands to meet together and exchange views. We do not doubt that the new friendships and connections formed on this occasion will stimulate the study of illumination abroad and pave the way for international co-operation on many pressing problems.

Recognition of these facts was expressed in the various addresses emphasizing the vast amount of useful work still awaiting the illuminating engineers of the world. This view was perhaps particularly well expressed by Dr. M. Luckiesh at Saranac in the words:—

"We need knowledge, but that knowledge is useless if left uninterpreted and unused. We need lighting specialists who see their opportunity and responsibility in a half-seeing world. A huge task is before us, but it is one in which we can be proud to do our part. What better way is there to add to the world progress than in utilizing the possibilities of lighting and vision in contributing to the greater efficiency, safety, comfort and happiness of mankind?"

Illuminating Engineering in Russia

WE note with pleasure evidence of the growth of interest in illuminating engineering in Russia, as illustrated at the recent electrotechnical conference in Leningrad.* On this occasion quite a number of papers dealing with photometry and illumination were read. Mr. P. M. Tichodejew described some experiments on standard lamps from various laboratories in France, Great Britain and the United States. Mr. G. W. Bondarenko dealt with the manufacture of incandescent lamps, and analysed the influence of variations in design on performance; and Mr. B. P. Kosireff read a paper on the determination of the temperature of incandescent filaments. Mr. R. A. Saposchnikoff contributed a mathematical study of light-distribution problems, and presented a diagram enabling the coefficient of utilization to be deduced under varied conditions. Messrs. K. L. Askinass and N. I. Petroff gave a survey of present practice in regard to illumination in aerial navigation, and Mrs. L. I. Djemkina discussed the origin of coloration in optical glasses.

In the course of the proceedings a special resolution was passed recommending the encouragement of researches on illumination and the holding of a special conference where more numerous papers on various aspects of illumination might be read. It appears to have since been determined that two such conferences should be held at the end of the present year: one devoted to industrial aspects, the other to more scientific and technical matters.

Obituaries

Mr. Harold John Hall.

WE record with deep regret the death of Mr. Harold John Hall, Chief Engineer and Manager of the Electric Street Lighting Apparatus Co., of Canterbury, which occurred on October 4th. We understand that Mr. Hall's death, at the early age of 31, was due to complications arising from malaria contracted in Palestine and Egypt during war service.

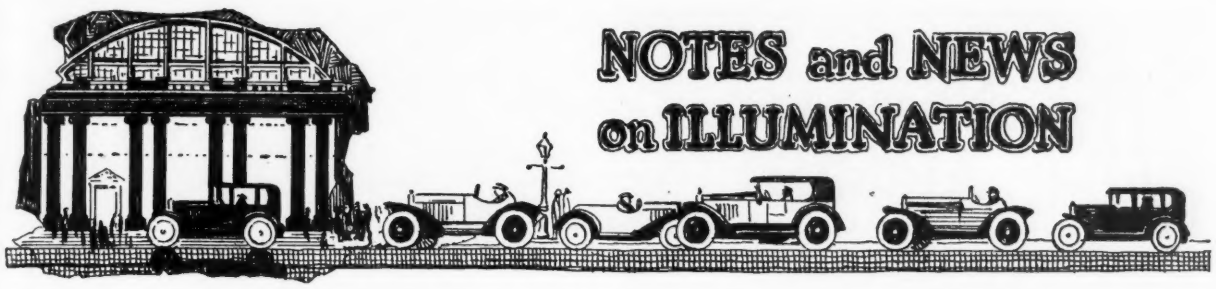
Mr. Hall was well known as a young man of considerable ability, and was liked and respected by all who met him. It is but a short time since he was taking an active part in the Conference of Public Lighting Engineers, arranged in Sheffield last July. No one at that time could have foreseen that the Illuminating Engineering Society would lose so soon this young and promising member, and we feel sure that the news will be received with general regret.

Mr. Noah Wright.

IT is with regret that we have to chronicle the sudden death (after a short illness), on Saturday, October 13th, of Mr. N. Wright, Public Lighting Engineer of the County Borough of Bournemouth and President-elect of the Association of Public Lighting Engineers; the cause of death was para-typhoid and enteric.

As recently as July last, at the Sheffield Conference, Mr. Wright was chosen as next year's President. He had been working hard, and was looking forward to the activities of the forthcoming Bournemouth summer meeting. The interment at Bournemouth was attended by Mr. Councillor A. Sutton (Chairman) and the members of the Lighting Committee of the Bournemouth Corporation. The Association was represented by Captain W. J. Liberty, Hon. Secretary, who laid a wreath at the graveside on their behalf.

* *Licht und Lampe*, October 4th, 1928.



Illuminated Police Officers on Point Duty

By the courtesy of *The Electrical Review* we reproduce two illustrations showing the device introduced by Mr. A. C. Cramb in Croydon, to enable the figures of officers on point duty to be clearly seen. The work of such officers at busy crossings is always arduous. It becomes increasingly difficult and occasionally dangerous if they cannot be quickly distinguished by motorists. The arrangement adopted in Croydon is the result of experiments made by Mr. Cramb and his staff and, on the recommendation of the police authorities, has been installed at main traffic junctions. The apparatus consists of a standard motor-car headlight mounted on the nearest lamp post, Fig. 1, and arranged to give a concentrated beam at an angle to the ground of about 45 deg., so directed as to illuminate the arms and head of the constable on point duty. A 35-watt, 12-volt automobile lamp is used, and a waterproof-type transformer is also attached to the post to step-down from the supply voltage. The current consumption is exceptionally low, and where such lights are paid for by the local authority it is possible to erect and maintain the "Croydon" lamp for an almost nominal amount. In some cases where circumstances permit, and overhead tramway wires are not in use, it is possible to hang the lamp from span wires immediately over the point-duty man, fixing the transformer on to a post at one end of the span wiring and running 12-volt leads therefrom. Fig. 2 is a reproduction of a photograph of a policeman on duty "in the limelight."

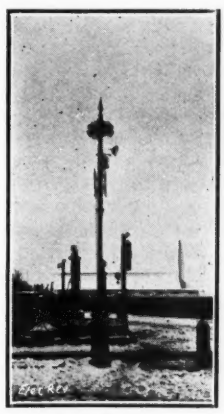


Fig. 1.—The "Croydon" Lamps.

Fig. 2.—An Illuminated Policeman.

The Electrical Association for Women

We are glad to see that the Electrical Association for Women is making good progress. An attractive series of events, including both lectures and visits, has been arranged for the autumn. In addition a special series of evening lectures has been arranged at the E.L.M.A. Lighting Service Bureau. On October 15th, Mr. W. J. Jones gave a lecture on "Electric Light in Factories as it Affects Production and Hygiene." Other items include addresses by two ladies who are experts on salesmanship and publicity matters, Miss Gladys Burlton, who is Principal of the Burlton Business Institute, and Miss Nora Miller, Publicity Manager to the Edison Swan Electric Co. We have also received a copy of the "Women's National Specification," which has been prepared for the guidance of those concerned with the provision of electricity in new houses. By the aid of diagrams the number and positions of outlets desirable in average living rooms is shown. We hope that this specification will have a useful influence. In some housing schemes facilities for lighting have been hardly adequate. The very first consideration in a house supplied with electricity is to see that the lighting is adequate and that householders can take advantage of the flexibility of the system by appropriate outlets.

Retirement of Mr. Walter T. Dunn

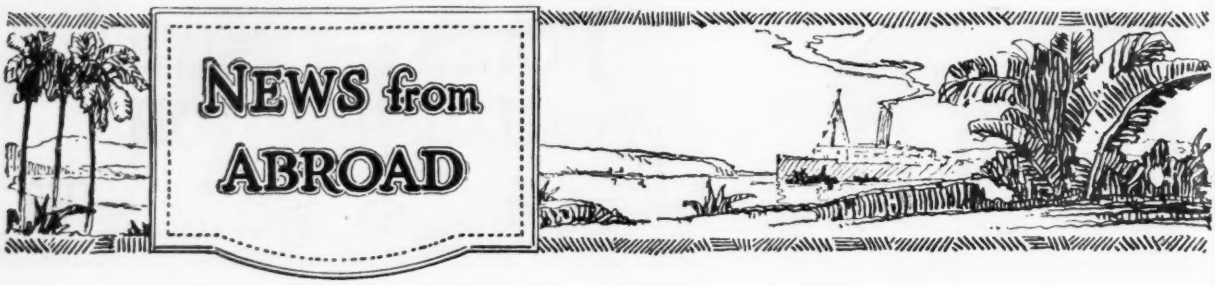
We understand that Mr. Walter T. Dunn is resigning his position as secretary of the Institution of Gas Engineers, and that at their last meeting the Council of the Institution accepted his resignation, placing on record their appreciation of his long and faithful service, extending over 32 years. Mr. Dunn has earned the gratitude of the Institution and of the gas industry generally; but there are many outside its ranks to whom he was personally known, and who will join in the wish that he will enjoy many years of well deserved rest and leisure.

Tennis by Artificial Light

The use of artificial light for games and sports, which formed the subject of a paper before the Illuminating Engineering Society some years ago, continues to become more general. The lighting of covered lawn tennis courts, in particular, has been developed. We understand that the arrangements at the Queen's Club have been much improved. Advantage is likely to be taken of this fact in view of the difficulty of getting events through at winter tournaments, when daylight is capricious and sometimes inadequate for a considerable portion of the day. It is significant that on the prospectus recently issued regarding tournaments at the Queen's Club a condition was inserted for the first time to the effect that in case of defective daylight competitors may be required to play by artificial light.

Street Lighting Novelties in the United States

We notice in *Municipal Engineering* a reference to several novel items in American street lighting. St. Louis, it is said, is to be equipped with a new unit which is to support the "world's largest street-lighting globe." The exact size of the globe is not stated, and though we are aware of the tendency towards more powerful units for public lighting we confess we are surprised to learn that it will be large enough to "comfortably contain a person of medium size." Another novelty, introduced in the city of Colon on the Panama Canal, is the adoption of public standards surmounted by large and clearly lettered clocks, which will serve a double purpose in illuminating the streets and keeping the inhabitants fully informed of the progress of time. It also appears that the State Street in Chicago, hitherto claimed to be the most brightly lighted street in the world must now give place to the Washington Boulevard in Detroit. In this thoroughfare new standards, each carrying five 100-watt units, a total of 5,000 watts, are to be installed. This is, no doubt, only one of many important street-lighting schemes being initiated in America. Public lighting engineers in this country cannot but feel somewhat envious of the scale on which such improvements are introduced.



Appraising the Effectiveness of Good Lighting

In a recent note in *The Electrical World*, Mr. M. Luckiesh points out certain difficulties that are inherent in attempts to establish the relation between improved lighting conditions and productive power. The two chief obstacles are the interference of disturbing factors which have no connection with the lighting conditions and the ability of the eyes to compensate for poor visual conditions by special effort. As this increased effort is not measured it may obscure the advantage of improved lighting. These complexities, however, may be overcome. Disturbing and irrelevant factors may be eliminated by carefully controlling the test, so that when the two sets of tests are made all circumstances except the lighting are the same. The solution of the second problem is less easy, but experience suggests that in such tests the worker should be induced to operate with a maximum expenditure of effort throughout; otherwise there is a margin and under the poorer conditions the eyes simply "take up the slack," with the result that little difference in output is apparent. In theory this is doubtless correct but in practice the effort of the human machine cannot be strictly controlled. This is one reason why repeated experiments on the relation between illumination and productive power are desirable.

Street Lighting in Tokio

A paper by Mr. T. Kashiki in the journal of the Electrotechnical Society of Wasada discusses fundamental principles in street lighting. The paper itself, being in Japanese, can hardly be analysed, though the author evidently deals in some detail with lighting units of the asymmetric type. From the abstract, which is in English, we gather that Japan is awakening to the importance of good public lighting, and that authorities are becoming dissatisfied with the somewhat irregular methods pursued. An instance is afforded by Tokio, where short posts terminating in 32 c.p. lamps have been erected chaotically, apparently in some instances by enterprising merchants who desired to improve the illumination in their area. A report on the subject was recently issued by the Tokio Institute for Municipal Research. The author points out that this problem requires the co-operation of citizens with lighting experts in order to render cities safer and more beautiful by night.

The Leipzig Fair

We understand from a correspondent that the second Leipzig Fair which has just terminated was not entirely successful. It is true that a considerable number of the smaller firms participated, but many of the leading concerns in the electrical industry did not, feeling that it was too soon after their exhibit in the spring to repeat the display. From a discussion of this problem in *Licht und Lampe* there seems to be a general impression that two fairs, one in the autumn and one in spring, are too much, and it has been suggested that in future only one fair should take place, in May, being thus intermediate between the spring and autumn events. On the other hand it might be contended by firms concerned with lighting appliances, who form a considerable proportion of exhibitors, that if one fair is to be held the autumn, corresponding with the beginning of the lighting season, is the best time.

Illuminated Connection Diagrams

A problem of considerable interest to central station engineers, the preparation of convenient illuminated connection diagrams for the protection of electrical installations, is discussed by Dr. M. Schleicher in a recent issue of *The Siemens-Schuckert Review*. A feature of large and complex installations nowadays is the design of control rooms, whence instructions based on the indications of instruments and the reception of messages and signals can be issued by superintendents to the operators. A necessary feature of the control room is the provision of illuminated diagrams showing the state of the load, etc. Various forms of diagrams are discussed by the author; all are intended to enable the actual distribution of energy in the system to be recognized at a glance. It is recommended that the load-distributor board should be circular in design so that it can be readily surveyed by the superintendent from his desk at the centre of the room. The building-up of the diagram in luminous coloured lines required much study. Originally strips of diffusing glass were proposed, but ultimately a translucent resinous formaldehyde substance, which can be worked with ease and is not brittle, was substituted. The insertion of the dials of instruments at convenient positions on the diagram also required consideration. The instrument must not be too large for it to be inserted in the illuminated lines, yet it must be capable of being read at a distance. The best solution was found to be an illuminated profile instrument, so constructed as to show a longer or shorter strip of light according to the position of the needle. The eye soon accustoms itself to gauge the value of the light strip, and this judgment was facilitated by allowing the strip to become coloured when, say, three-quarter load was reached. The method of providing the luminous strip was ingenious, light being furnished by a single filament lamp, and cut off quite sharply by a light metal screen attached to the moving pointer.

A Portable Photometer for Cinematograph Work

It has often occurred to us that photometery might be used more freely by those concerned with cinematograph work, both in the studio and in judging the performance of screens used in auditoriums. A simple little instrument, the "Filmograph Luxmetre," described in a recent issue of the *Revue d'Optique*, is designed to serve this purpose. It utilizes a half-silvered mirror by the aid of which the brightness of a lens illuminated by a standard lamp is compared with that of the object studied. It is hoped that the instrument will prove specially useful in comparing the brightness of various subjects and thus judging the desirable exposure.

Dr. Auer von Welsbach

Austria has recently been celebrating the birthday of Dr. Auer von Welsbach, the inventor of the incandescent mantle, who is now seventy years old. Although it was his researches on the rare earths that rendered Welsbach world-famous, he was responsible for many other inventions and was associated with the introduction of the osmium lamp and the ferro-cerium compounds which form the basis of the modern pocket lighter and other igniting devices. Dr. Welsbach to-day is still actively engaged on scientific work in the research laboratories set up in his castle in Carinthia.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Influence of Illumination on the Working Efficiency of Man*

By Dipl. Ing. L. SCHNEIDER (Berlin)

(*Concluded from p. 279.*)

THE speed of vision is derived from a combination of the speed of sensitivity and the form- or shape-sensitivity values. It gives the shortest time necessary for perceiving a certain contrast of a given form and a stated brightness. The results of the very thorough and complete tests of Ferree and Rand* with regard to the influences of brightness intensity and the speed of perception with different-sized objects and different contrasts are shown in Figs. 10 to 13. The test objects were Landolt's rings with openings of 1, 2, 3, 4.2 and 5.2 arc-minutes; the contrast of the rings to the paper on which they were printed being 1:4, 1:5.18, 1:7.25, 1:26. The brightness of the whole field of vision was identical with that of the test field. Fig. 10 gives the speed of perception for the Landolt's ring with an opening of 5.2 arc-minutes and different contrasts, of which the highest was 1:26 (deep black print on white paper), and the lowest 1:4 (about the contrast of a lead pencil line on paper). The ordinates represent the reciprocal values of the time of perception in 1 sec. For the sake of comparison, the times of perception are also given on the right-hand side. The investigations in the original work referred to intensities of illumination and not to the degrees of brightness. This explains why the curve for low-contrast—black print on grey paper—only goes up to about 200 lux on white. For the higher contrast—black print on white paper—the tests were continued up to 900 lux on white. Even for these high brightness values the speed of perception is still increasing. Fig. 11 shows the same experiments with Landolt's ring and the smallest opening of 1 arc-minute, upon which test the visual acuity definition is based. Here, even for the higher brightness values, the speed of perception still shows the relatively greater increase. This means that the speed of perception is greater with a high contrast than with a low one, and that it also increases with the increasing size of the objects. The Figs 12 and 13 show the tendency of the speed of perception curves for the same contrast values, 1:26 and 1:4; but with different-sized objects. They also prove that with larger test objects the speed of perception is decidedly higher than with smaller ones; for example, the speed of perception in the test with the Landolt's ring and an opening of 5.2 arc-minutes and 900 lux on white is seven times greater than that of the ring with an opening of 1 arc-minute. The Landolt's ring with an opening of 1 minute requires a 20 times higher brightness value for the same speed of perception, e.g., 0.02 sec., than the ring with an opening of 2 minutes. It follows from this that the speed of perception must increase with higher values of brightness, contrast and size of the object.

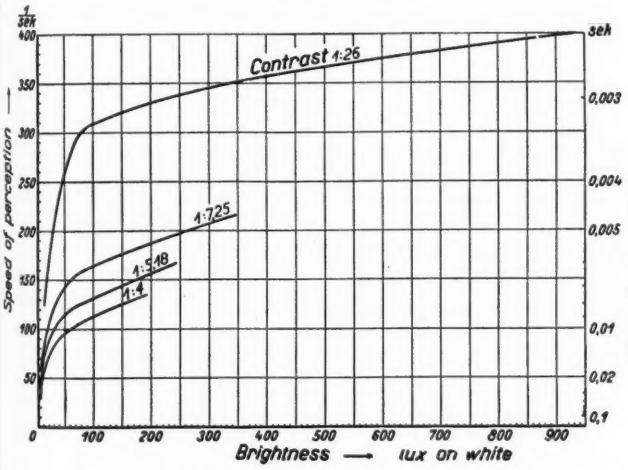


FIG. 10.—Brightness and Speed of Perception for same-sized object (5·2′) and Different Conrtasts.

The fundamental sensations of the eye, already mentioned, and their combinations, e.g., the discrimination sensitivity, the form sensitivity, the speed of sensibility, the sensitivity for stimuli of short durations, and the speed of perception, all represent threshold values that in practice are never underrun or exceeded; that means, most of the eye-work is executed under more favourable conditions than these threshold values would signify, so that the necessary intensities of brightness, and therefore the illuminating intensities needed, will,

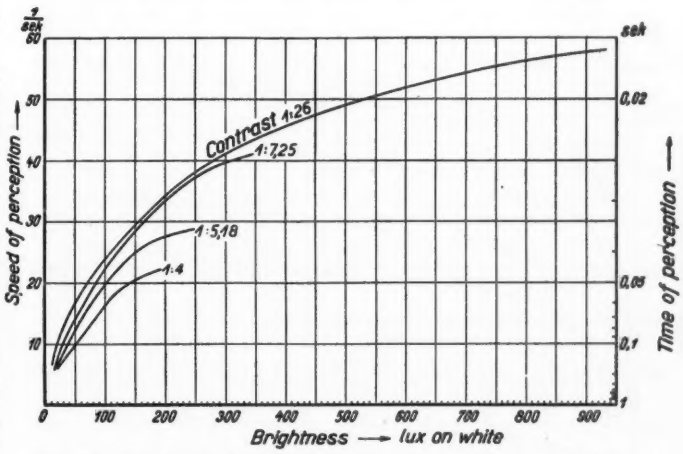


FIG. 11.—Brightness and Speed of Perception for same-sized object (one minute) and Different Contrasts.

* Ferree and Rand: Trans. Ill. Eng. Soc., 22, 79, 1927.

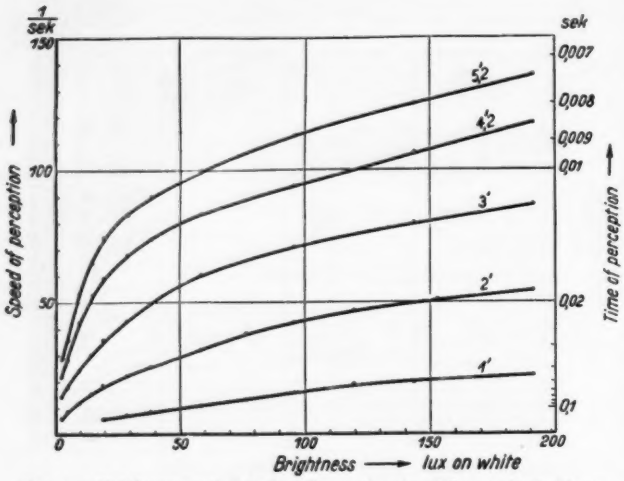


FIG. 12.—Brightness and Speed of Perception for different-sized objects and Constant Contrast (1 : 26).

under normal circumstances, also be lower than those here given. The illuminating intensities needed for the individual working operations can therefore not be determined from these investigations alone; for, as we shall see later on, account must here be taken of the especial psychotechnical studies necessary for the different working processes involved. The different influences of the illumination on the fundamental sensations of the eye must be taken as a basis for all research work of this nature.

The fundamental sensations essential for examining the effects of glare are, in a purely physiological sense, at least as important as those for determining the necessary intensities of illumination, for it was not possible until now to treat experimentally the problem of glare. The different forms of glare and their origin have already been discussed by Weigel.* A definite criterion for determining the incidence of glare is, on the other hand, as yet unknown. One supposes that glare is existent either when after-images occur† or when the brightness becomes so annoying that the eye instinctively tries to avoid it.‡ It is therefore surprising that two sets of experiments that were carried out under the last rather vague criterion of Blanchard,§ on the one hand, and Luckiesh and Holladay‖ on the other, gave very similar results, as shown in Fig. 14. The values given denote the upper limits of the relative direct glare. The glare will now have to be examined with respect to its effect on the fundamental sensations of the

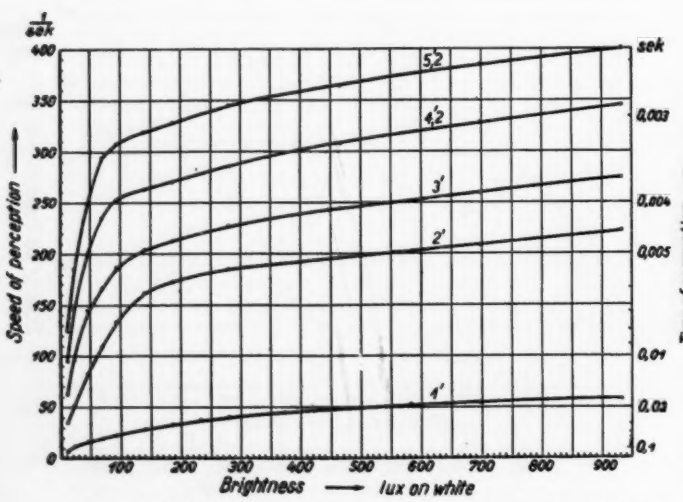


FIG. 13.—Brightness and Speed of Perception for different-sized objects and Constant Contrast (1 : 4).

eye. Luckiesh and Holladay have already adopted the sensitivity of the eye for different contrasts as a criterion for other experimental work in glare carried out by them. In consequence of the incomplete numerical test data given, it is unfortunately impossible to give nearer details of this work here. In a more recent study on the question of glare in street-lighting work, Holladay¶ accepts the discriminating sensitivity as a criterion (Fig. 15). The higher curve gives the discriminating sensitivity when using a ring of 55 minutes mean diameter, and a width of 37 minutes as a test object, its brightness intensity decreasing from the centre to the outer edges. The other curves show the effect of glare in decreasing the discrimination sensitivity, whereby the glaring light sources were 5° out of centre, the numbers next to the curve denoting the light intensities of the glare sources. (As in this work only the illumination that the glare-producing source brings to bear on the cornea of the eye was given, it was only possible to calculate the candle-power of the glaring light source, but not its brightness.) It will be seen from the curves that the discrimination sensitivity is much lower when the intensity of the glare-producing source increases, especially in the region from 1 and 0.1 lux on white (0.1 and 0.01 foot-candle). This occurs in a range of adaptation brightness that even to-day is still quite universal for street lighting. The curves shown in Figs. 3 and 4, illustrating the influence of the brightness of surroundings on the discrimination sensitivity of the inside field, are in reality nothing else but the relation of discrimination sensitivity to the relative indirect glare. It will therefore now be possible, with the assist-

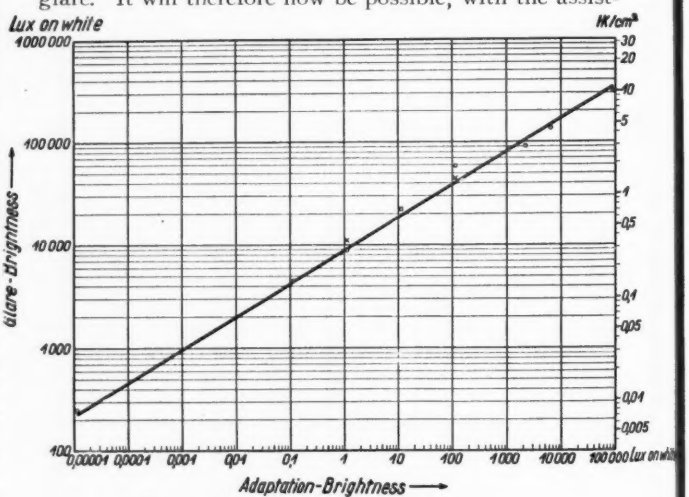


FIG. 14.—Adaptation and Glare Brightness.

ance of the fundamental sensations of the eye, to examine the effects of glare, and we may therefore hope to be able to give the values for permissible brightness levels that would not cause glare. In a similar manner it should also be possible to examine the effect of the colour of light on different fundamental sensations, as, for instance, König and Brodhun and Korff-Petersen have already done, even although this last question is not as yet so very important as compared with the problem of glare itself. As we have already seen above, the demands made in regard to illumination, glare, etc., are, generally speaking, *limit values*, i.e., they do not apply generally, but are mainly applicable to exceptionally fine or very fatiguing work. The conditions in actual practice are to a certain extent more favourable, inasmuch as the conditions of contrast, size, etc., are often better; also psychological influences that have purposely not been considered in the different problems here discussed may also have a certain beneficial effect. This can best be demonstrated with the assistance of practical examples. A few results of different psychotechnical tests actually carried out shall therefore now

* Weigel : *Licht und Lampe*, 921, 1925.
† Lux : *Licht und Lampe*, 1, 1924.
‡ Lux : Zeitschr. f. Beleucht.Wesen, 128, 1920.
§ Blanchard : *Phys. Review*, 11, 81, 1918.
‖ Luckiesh and Holladay : Trans. Ill. Eng. Soc., 20, 221, 1925; *Licht und Lampe*, 459, 1925.
¶ Holladay : Journ. Opt. Soc., Am., 14, 1, 1927.

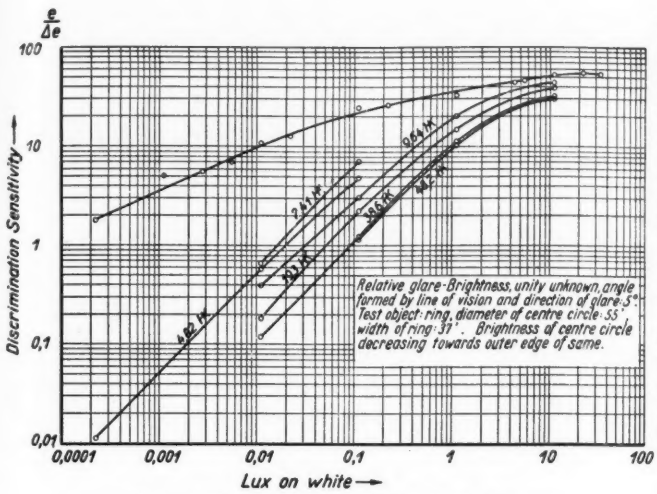

Discrimination Sensitivity
Lux on white
Relative glare-Brightness unity unknown, angle formed by line of vision and direction of glare 5°. Test object: ring, diameter of centre circle 55', width of ring 37'. Brightness of centre circle decreasing towards outer edge of same.

FIG. 15.—Glare and Discrimination Sensitivity.

be reproduced. The curves given in Fig. 16,* for instance, show the speed of reading as a function of the illumination in tests made with the same group of test subjects as were taken for the experiments of Fig. 5. The curves show that the speed of reading already attains its maximum value at an illuminating intensity of approximately 50 lux (4.2 foot-candles) that would amount to a brightness of about 35 to 40 lux on white (3.5 to 4 foot-candles). The conditions of this test were almost the same as those of the curves for 2 minutes or 3 minutes in Fig. 12. The course of the curves is also similar, except that the kink of the speed of perception curve is somewhat higher than in Fig. 16. The explanation for this is as follows: In the speed of reading tests a continuous text had to be deciphered, therefore the psychological influence of the complete sentences made it no longer necessary that the individual letters need be clearly distinguished. It was, on the contrary, now possible to recognize groups of letters or words at a glance, and so build up the sentences, for which reason a minute scrutiny was no longer necessary. In Fig. 17 the influence of the illumination on the working efficiency of two lamp filament mounters (females) is shown.† As the girl in the upper curve has been constantly doing this work for two consecutive years, and the second girl (lower curve) for over two years, it may be supposed that the influence of practice, and to a certain extent of fatigue also, can here be excluded. The results show that by increasing the illumination from 75 to 4,000 lux (6.3 to 330 foot-candles) the mean efficiency of the first girl increases by 13.2 per cent., and that of the second one by 6.1 per cent. In regard to the most economic illumination necessary for this work, it should be mentioned that, given a due knowledge of a greater number of such filament-mounting tests, it is a very simple matter to figure out an economic maximum at which the extra expenses involved on account of the higher illumination are more than counterbalanced by the increased efficiency. In Fig. 18 the influence of the illumination on the working efficiency in a typesetting room is shown as a result of tests carried out by Weston and Tailor.‡ The test subjects were two experienced typesetters. To eliminate the " week-end " effects, the tests were made on Tuesdays and Thursdays at the usual working hours. The type used was so-called nonpareil type, and the manuscript was in print, with corrections made in ink. The black curve shows the increase of efficiency resulting from higher illuminating intensities, e.g., by an increase of illumination from about 16 to 300 lux (1.35 to 25 foot-candles). A resulting increase in working efficiency of about 32.5 per cent. was effected. The typesetting errors (dotted curve) relative to the efficiency shows a decrease of approximately 1.4 to about 0.6 per cent., that is, about 57 per cent., and the letters standing upside down with relation to the typesetting errors (dotted and dashed line) from 24 to 11 per cent., also just about 54 per cent. decrease.

Ives and Sydenstrick§ have made extensive tests on the efficiency in a letter-sorting department of a post office in New York. In Fig. 19 the lower curve shows the increase of sorted letters per man and hour in kilogrammes after having increased the illumination intensity from 40 to 92 lux (3.4 to 7.7 foot-candles). The upper curve (right-hand ordinate scale) gives this result in relation to the highest efficiency when sorting letters into 34 bins, and the increase in efficiency amounted to

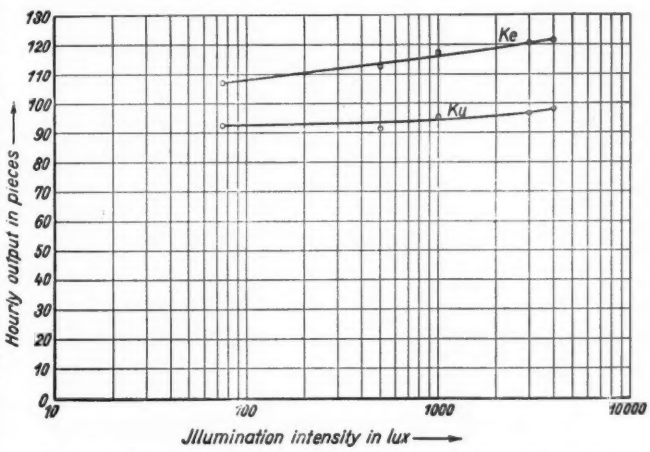


FIG. 17.—Winding Filaments on Supports for Metal-Filament Lamps.

11 per cent. Fig. 20, on the other hand, shows the effect of the illumination on the efficiency in sorting letters into 50 bins, the lower curve giving the absolute efficiency (left-hand ordinate scale) and the upper curve showing the relative efficiency with respect to the highest value (right-hand ordinate scale). When comparing these curves it will be noticed that the absolute efficiency in sorting express letters into 34 bins was just about twice as high as when sorting general letters into 50 bins; after all, a very natural result. The increase in efficiency due to illumination in the last-mentioned test, however—that is, when sorting letters into the 50 bins—is relatively higher, and amounts to 17 per cent. against 11 per cent. in the first test. This greater increase is due to the fact that when sorting letters into 50 bins the eye-strain is greater than when only using 34 bins, and consequently the illumination will have a greater influence on the results of the more difficult first test. The tests were carried out during a whole year, and their order was so arranged that the illumination was not gradually increased from month to month; but, as can be seen from the different values of the lower curve and from the register given, a particular order was purposely not observed, so that the effects of practice and of season had no effect on the results.

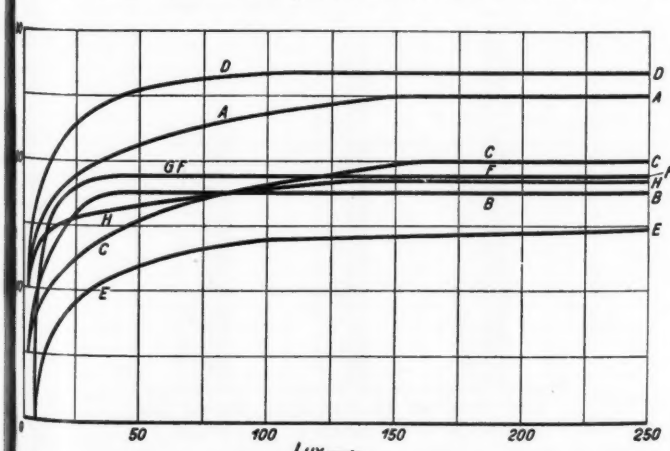


FIG. 16.—Relation of Speed of Reading to Illumination.

* Korff-Petersen : a.a.O.

† Ruffer : *Licht und Lampe,* 245, 1927.

‡ Weston and Tailor : London, 1926.

§ Ives and Sydenstrick : New York, 1926.

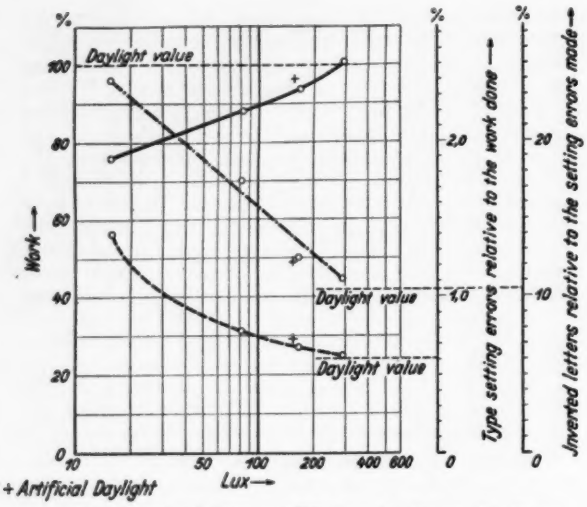


FIG. 18.—Illumination and Efficiency in a Typesetting Room.

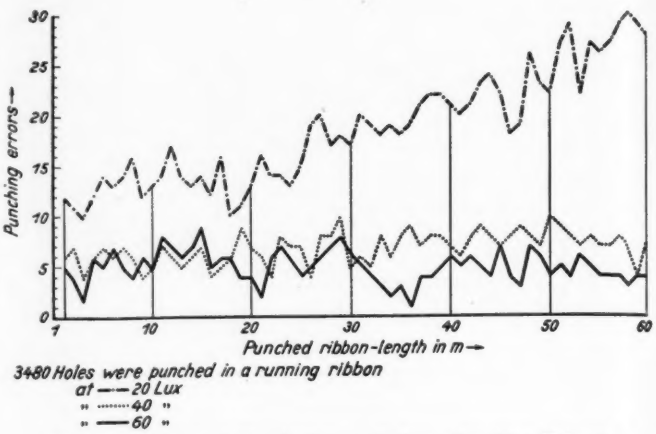


FIG. 21.—Influence of Illumination on Fatigue (Punching Holes in a Running Ribbon).

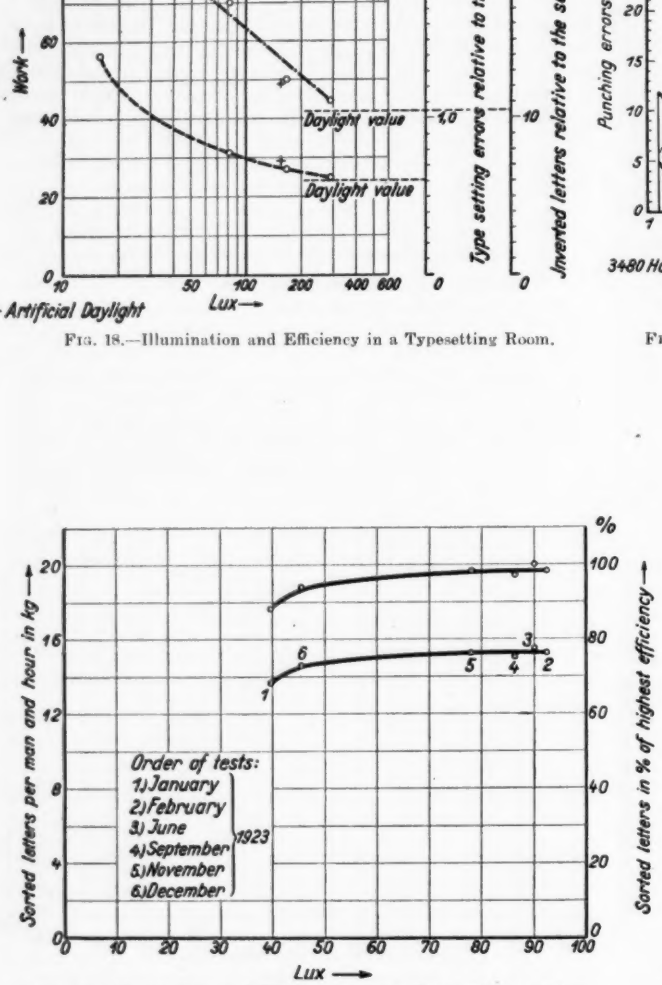


FIG. 19.—Illumination and Efficiency in Post Office Work. Sorting Express Letters in the 34 Bins.

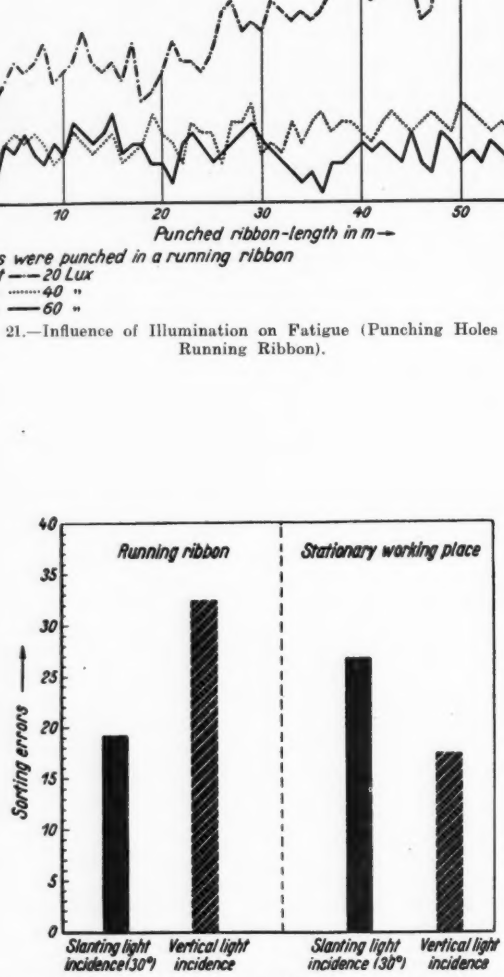


FIG. 22.—Influence of Conditions of Shadow on Working Efficiency when Sorting Screw Nuts.

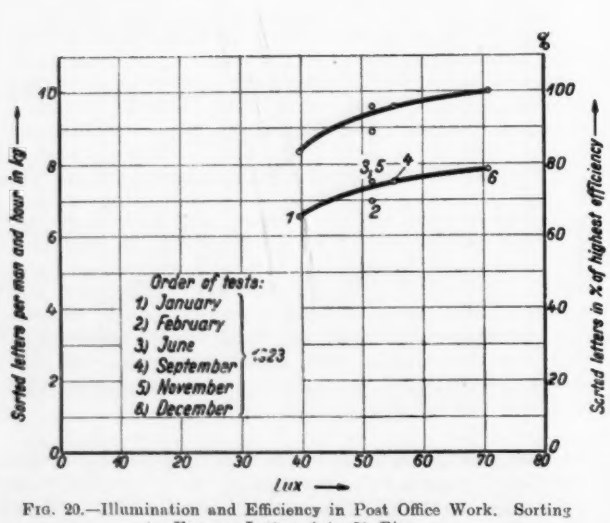


FIG. 20.—Illumination and Efficiency in Post Office Work. Sorting Express Letters into 50 Bins.

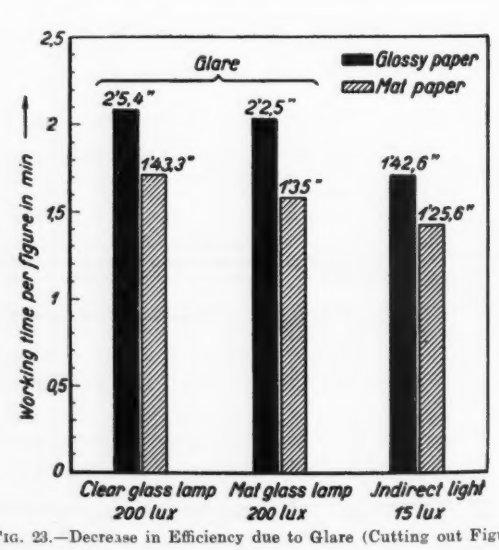


FIG. 23.—Decrease in Efficiency due to Glare (Cutting out Figures).

In another set of experiments that are still being carried out in co-operation with the writer of this paper in a coalmine underground it was possible after increasing the illumination intensity to 10 and 20 lux (0.8 to 1.7 foot-candles)—the former intensities of the portable mine lamps could hardly be measured—to raise the output by 16 per cent. A more detailed report of this investigation will be given later.

It can readily be seen from the examples given how the intensity of illumination influences the efficiency in different working processes, or vice versa. It can also be shown that insufficient illumination will cause premature fatigue. The influence of insufficient illumination on fatigue is shown in Fig. 21.* In these tests the test subject had to punch holes in a strip of paper, moving at constant speed and marked at irregular, predetermined intervals. The uppermost curve gives the number of errors for the whole length of paper strip at an illumination intensity of 20 lux. The increase of errors in the course of the test gives a clear idea of the influence of insufficient illumination on fatigue. The lower curve shows the number of errors at 60 lux, and as the errors remain nearly constant during the whole working process no signs of fatigue are here noticeable. In addition to the intensity of illumination, other factors that are connected with the *quality* of the illumination will, of course, affect the efficiency. Fig 22† shows the influence of the shadow on the efficiency of sorting screw-nuts. The nuts were first sorted on a running belt moving with a speed of 40 metres (44 yards) per minute, transporting one nut to the working place every two seconds. By means of a special arrangement the influence of practice and fatigue were compensated. The left-hand column shows the sorting errors on a running belt with a slanting direction of light, resulting in fairly strong contrasts due to the shadows cast. The right column gives the number of sorting errors with a vertical direction of light, resulting in an almost shadowless illumination. The number of errors here increased by roughly 70 per cent. On the other hand, when the nuts were contained in a box on a fixed bench the slanting light caused so many cast shadows, and therefore so strongly affected discrimination, that the sorting errors with the vertical light and its resulting shadowless illumination went down by about 35 per cent., with a consequent increase in efficiency.

The influence of glare on efficiency was also tested by the same writer, as is shown in Fig. 23.‡ In this test the subjects had to cut figures out of the mat or glossy paper of the same colour. Effects of practice and fatigue were here also compensated. Fig. 23 illustrates the influence of glare. The time necessary for cutting out one figure is given in minutes. The time needed was longest when the paper surface was illuminated with 200 lux (17.0 foot-candles) by a bare and, therefore, glaring lamp. With a frosted lamp—but otherwise with the same illuminating intensity—the necessary time for work decreased with glossy paper by about 2 per cent., with mat paper by 8 per cent.; with an indirect, non-glaring illumination, however, with only 15 lux (1.3 foot-candle) and glossy paper, by 18 per cent., and with mat paper 30 per cent. It should here be remembered that the intensity of the glaring illumination amounted to 200 lux, while that of the non-glaring illumination had only 15 lux. The influence of the conditions of the surface may also be significant. For instance, the necessary working time when cutting mat paper is 16 to 25 per cent. lower than when working with glossy paper, and the efficiency is correspondingly higher.

To sum up, we can affirm that all the factors comprising the quality of illumination may have a decided influence on the working efficiency of man. We are at present only at the commencement of the study of the influence of illumination on different forms of work. A long time must elapse before we are able to determine the most economic intensity of illumination for every working operation of daily life. But at least a start has been made. It does seem, from what has already been said on the subject, that we now have the possibility of gradually bridging the still existing gap between psychological and physiological aspects. Ultimately we may hope to become better acquainted with all the factors that influence the relation between illumination and the working efficiency of man, and to create the necessary basis for psychotechnical investigations.

* Kuhn : Deutsche Psychologie IV, 1, 1927.
† Kuhn : a.a.O.
‡ Kuhn : a.a.O.

The International Illumination Congress

IN our next issue we hope to deal more fully with some of the proceedings at this important Congress, from which delegates will have returned by the time this issue appears. Meantime we give a summary of the chief items in the official programme, in order that readers may judge of the wide interest of the proceedings at this important gathering.

It will be recalled that the whole visit was divided into three parts. There was, first, the tour of inspection, occupying September 7th–17th; next the Convention of the American Illuminating Engineering Society, which took place in Toronto during September 17th–20th; and, finally, the plenary meeting of the International Commission on Illumination, which was held at Saranac Inn, N.Y., during September 22nd–28th.

The tour included visits to New York, Boston, Philadelphia, Washington, Cleveland, Detroit, Chicago and Toronto, and Niagara Falls, after which the member-visitors proceeded to Toronto. Amongst interesting places visited may be mentioned the Engineering Society's Building, the Electrical Testing Laboratory, and the Edison Lighting Institute in the New York area; the Lynn Works of the General Electric Co., near Boston, the Philadelphia Electric Co.'s building (floodlighted in colour), and the plant of the Baldwin Locomotive Works in Philadelphia; the Bureau of Standards, Washington; Nela Park, Cleveland; the Ford Motor Works, Detroit; and many interesting special installations in Chicago, as well as the famous stock yards.

At Toronto the official programme was as follows:—

Twenty-Second Annual Convention of the Illuminating Engineering Society, U.S.A. (Toronto, Sept., 17th-20th).

MONDAY, SEPTEMBER 17TH.

10-30 a.m.—*Opening Session.*

Address of Welcome—Samuel McBride, Mayor of Toronto.
Response to Address of Welcome.
The Presidential Address—Norman Macbeth.
General Secretary's Report—L. H. Graves.
Report of Committee on Progress—F. E. Cady.

2 p.m.—*Natural Lighting Session.*

The Utilization of Exterior Reflecting Surfaces in Daylighting—W. C. Randall and A. J. Martin.
Biological Effects of Natural Lighting—Alan Brown.
Treating the Windows to Conserve Daylight—H. H. Higbie.
Illumination Research at the National Physical Laboratory—J. W. T. Walsh.

2 p.m.—*Parallel Lighting Practice Session.*

Bank Lighting—J. L. Stair.
The Lighting of the Philadelphia Museum of Art—Ward Harrison.

8 p.m.—

Address by C. C. Paterson, President, International Commission on Illumination.
Decorative Lighting for Out-of-Doors—A. L. Powell.

TUESDAY, SEPTEMBER 18TH.

9-30 a.m.—*Lighting Service Session.*

Operating Characteristics of Gaseous Tube Signs—H. A. Cook.
The Advertising Value of Mobile Colour Lighting—A. A. Brainerd and J. A. Hoeveler.
Relighting of the First Church of Christ, Scientist, in Boston, Massachusetts—R. B. Brown, junr., and K. A. Piez.
New Section of the Lighting Service Manual—Julius Daniels.

9-30 a.m.—*Parallel Laboratory Session.*

Glare and the Four Fundamental Factors in Vision—P. W. Cobb and F. K. Moss.
An Interlaboratory Comparison of Coloured Photometric Filters—E. C. Crittenden and A. H. Taylor.
Transmission of Light through Liquids and Vapours—S. G. Hibben.
The Effect of Solarization upon the Ultra-violet Transmission of Window Materials—W. W. Coblentz and R. Stair.

Evening—*Ladies' Night.*

Supper at Hart House—Demonstrating :—
Lighting the Home for Special Occasions—Lillian E. Eddy.
L'Art Moderne in Lighting—The Development in Europe—H. Maisonneuve.
L'Art Moderne in Lighting—The Echo from America—E. H. Bostock.

WEDNESDAY, SEPTEMBER 19TH.

9-30 a.m.—*European Lighting Session.*

The Status of Lighting in Europe—C. A. Atherton.
Electric Lighting Development Activities in Europe—W. E. Bush.
Methods of Lighting Promotion Adapted to Economically Weak Nations—Dr. M. O. Bausenwein.

2 p.m.—*General Session.*

Report of Committee on Lighting Legislation.
Fundamentals—L. Schneider.
General Lighting Plus—M. Luckiesh.
Lighting and Wiring Requisites for Convention Rooms—Walter Sturrock.

THURSDAY, SEPTEMBER 20TH.

10-30 a.m.—*Lighting Practice Session.*

Report of Committee on Light and Safety.
The Illumination of Snellen Charts—An Investigation of Practice and Recommendations for Standardization—R. S. Burnap and E. C. Jackson.
Artificial Light as an Aid to Surgery—Henry L. Logan.
Illumination of Endless Caverns—W. A. Oglesby.

2 p.m.—*General Session.*

Brightness of Street Surface as a Factor in Street Illumination—Preston S. Millar.
Report of Motor Vehicle Lighting Committee.
An Investigation of Motor Vehicle Headlighting Requirements—H. C. Dickinson.
The Transition in Lighting for Motion-Picture Production—R. E. Farnham.

International Commission on Illumination (Saranac Inn, N.Y, Sept. 22nd-28th).

PROVISIONAL PROGRAMME.

SATURDAY, SEPTEMBER 22ND.

2-30 p.m.—
Meeting of Executive Committee.

MONDAY, SEPTEMBER 24TH.

9-30 a.m.—
Plenary Meeting; Opening Session, followed by a Technical Meeting on Street Lighting.

2 p.m.—*Technical Meetings.*

Automobile Headlights (*a*).
Distribution of Luminous Flux (*b*).
Photometric Test Plates (*c*).

TUESDAY, SEPTEMBER 25TH.

9-30 a.m.—*Technical Meetings.*

Natural Lighting (*a*).
Lighting Education (*b*).
Vocabulary (*c*).

2 p.m.—*First General Session.*

The Relation between the International Commission on Illumination and the National Organizations for the Study of Lighting.

WEDNESDAY, SEPTEMBER 26TH.

9-30 a.m.—*Technical Meetings.*

Lighting of Factories and Schools (*a*).
Aviation Lighting (*b*).
Definitions and Symbols (*c*).
Coloured Signal Glasses (*d*).

2 p.m.—SECOND GENERAL SESSION.

THURSDAY, SEPTEMBER 27TH.

9-30 a.m.—*Technical Meetings.*

Diffusing Materials (*a*).
Residence Lighting (*b*).
Precision Photometry—followed by Photometric Standards (*c*).
Motion-Picture Lighting (*d*).

2 p.m.—*Technical Meetings.*

Show-Window Lighting (*a*).
Heterochromatic Photometry—followed by Colorimetry (*b*).
Glare (*c*).

FRIDAY, SEPTEMBER 28TH.

9-30 a.m.—
Plenary Meeting; Closing Session.
2 p.m.—
Meeting of Executive Committee.

GENERAL SESSIONS.

I.—TUESDAY, SEPTEMBER 25TH.

2 p.m.—
The Relation between the International Commission on Illumination and the National Organizations for the Study of Illumination.
Formal Address by the President.
International Organization—P. Good.

II.—WEDNESDAY, SEPTEMBER 26TH.

2 p.m.—
Scientific Applications of the Radiation of Various Wavelength on the Study of Paintings in Museums and Collections—F. Cellerier.
Discharge Tube for Photometric Measurements in the Ultra-Violet—E. Lau.
Some Problems for Inter-Reflection—H. Buckley.
Contributions to the Lighting Art from Researches in Light and Vision—M. Luckiesh.
Gaseous Conduction Lamps—D. MacFarlan Moore.
The Application of Rational Principles to Decorative Lighting.—J. Wetzel.

OPENING PLENARY SESSION.

Report of the President on the Work of the Commission since the last Session.
Report of Treasurer.
Nomination of Editing Committee.
Revision of Constitution.

CLOSING PLENARY SESSION.

Presentation of Report of Editing Committee.
Election of President, Vice-Presidents, Honorary Secretary, and Treasurer.
Presentation of Budget by the Treasurer and Action on Annual Contribution for the next three years.
Tentative Decision on Date and Place of Next Session.

[*On the following page a classified list of the chief papers is given, but we understand that this was subject to possible additions and modifications.*]

CLASSIFIED LIST OF PAPERS.

MONDAY, SEPTEMBER 24TH.

Following the Opening Session—*Street Lighting.*

Report of Secretariat Committee (German Committee).
The British Standard Specification for Street Lighting—C. C. Paterson.
Physiological Fundamentals of Street Lighting— L. Schneider.
The Reflection Characteristics of Road Surfaces—A. K. Taylor.
Calculations of the Lighting Requirements for Public Roads and Open Spaces.
American Traffic Control by Illuminated Colour Signals—C. A. B. Halvorson.

2 p.m.—*Automobile Headlights.*

Report of Secretariat Committee (U.S. Committee).
The Divergence of Beams from Parabolic Reflectors—J. W. Ryde and Doris E. Yates.
The Automobile Headlight and its Standardization, Chiefly with Reference to the Linear Filament—L. W. B. Jolley.
General Considerations on Automobile Headlamps—P. Bossu.

2 p.m.—*Distribution of Luminous Flux.*

Report of Secretariat Committee (Belgian Committee).
Study of the Distribution of Flux from Lighting Devices—J. Wetzel.
Classifications of Lighting Appliances by the Method of Distribution of Flux—H. Desarces and D. Demeure.

2 p.m.—*Photometric Test Plates.*

Report of Secretariat Committee (Austrian Committee).

TUESDAY, SEPTEMBER 25TH.

9-30 a.m.—*Natural Lighting.*

Report of Secretariat Committee (British Committee).
Daylight and Public Health—P. J. Waldram.
Planning for Daylight—J. G. West.
The Protection of Pictures and Museum Specimens from Fading—J. A. MacIntyre and H. Buckley.
Distribution of Energy in Daylight—H. H. Kimball.

9-30 a.m.—*Lighting Education.*

Response of the National Committees to the Questionnaire of the American Committee.

9-30 a.m.—*Vocabulary.*

Report of Secretariat Committee (Swiss Committee).

WEDNESDAY, SEPTEMBER 26TH.

9-30 a.m.—*Lighting of Factories and Schools.*

Report of Secretariat Committee (American Committee).
Tests Concerning the Influence of Illumination on Production and Fatigue in Manual Labour—M. Cohu.
Principles of Illumination—W. Trub.

9-30 a.m.—*Aviation Lighting.*

Response of National Committees to the Questionnaire of the American Committee.

9-30 a.m.—*Definitions and Symbols.*

Report of Secretariat Committee (French Committee).
Photometric Units and Standards Based on the C.G.S. System—A. Blondel.

9-30 a.m.—*Coloured Signal Glasses.*

Report of Secretariat Committee (British Committee).
Standardization of Signal Glasses—W. Dziobek and M. Pirani.
On the Selection of a Suitable Yellow Glass for Railway Signals—J. Guild.
Practical Considerations in the Selection of Standards for Signal Glass in the United States—H. P. Gage.

THURSDAY, SEPTEMBER 27TH.

9-30 a.m.—*Diffusing Materials.*

Report of Secretariat Committee (German Committee).
The Precise Measurement of Optical Transmission, Reflection and Absorption Factors—J. M. Waldram.
Experimental Studies on Liquid Samples of Turbid Media—E. Lax, M. Pirani and H. Schonborn.
Diffused and Direct Filters and Methods for Measuring Same—W. Dziobek.

9-30 a.m.—*Residence Lighting.*

Response of National Committees to the Questionnaire of the American Committee.

9-30 a.m.—*Precision Photometry.*

Report of Secretariat Committee (Holland Committee).

Following the Meeting on Precision Photometry—*Photometric Standards.*

Realization of the Warburg Rational Light Unit—C. Muller and R. Frisch.
Discussion of a Rational Unit of Light by Means of Absolute Measurements of Total Radiation—C. Muller.
The Status of Candle-power Standards—E. C. Crittenden and F. B. Meyer.
Comparison of Photometric Standards between the National Physical Laboratory at Teddington and Eidg.—E. Konig and F. Buchmuller.

9-30 a.m.—*Motion-Picture Lighting.*

Report of Secretariat Committee (Japanese Committee).

2 p.m.—*Show-Window Lighting.*

Response of National Committees to Questionnaire of American Committee.

2 p.m.—*Heterochromatic Photometry.*

Report of Secretariat Committee (French Committee).

Following the Session on Heterochromatic Photometry—*Colorimetry.*

Report of Secretariat Committee.

2 p.m.—*Glare.*

Report of Secretariat Committee (Italian Committee).
Recent Measurements of the Effect of Glare on the Brightness Difference Threshold—W. S. Stiles.
Glare—Preston S. Millar.

Illuminating Engineering Society

SPECIAL MEETING IN BIRMINGHAM.

The first of the series of special meetings arranged at leading provincial centres took place in Birmingham on October 22nd, when Mr. R. A. Chattock (City Electrical Engineer, Birmingham) presided. There was an excellent attendance, the Assembly Room at the Chamber of Commerce (which can accommodate about 300) being almost completely filled.

An introductory address was delivered by Mr. D. R. Wilson, C.B.E., who gave a short account of the aims and objects of the Illuminating Engineering Society, referred to the importance of industrial lighting, and expressed the hope that some of those in Birmingham would join the Society and enjoy the advantages of membership as much as he (Mr. Wilson) had always done.

Mr. J. L. H. Cooper then read his paper entitled "An Investigation of Electric Lighting in the Engineering Industry," and an interesting discussion ensued in which Prof. W. Cramp, Mr. L. E. Buckell and others took part. The interest and enthusiasm shown at this meeting was most encouraging, and there is every reason to think that the subsequent gatherings in Manchester, Newcastle and Glasgow will be equally successful. A full account of the proceedings at these meetings will appear in our next issue.

Some Novel Lighting Schemes in France

WE have previously drawn attention to the tendency for lighting in France to develop on somewhat original lines. Typical examples of such installations have appeared from time to time in *Lux*, and we are indebted to the Editor, Monsieur J. Wetzel, for the three pictures reproduced below.

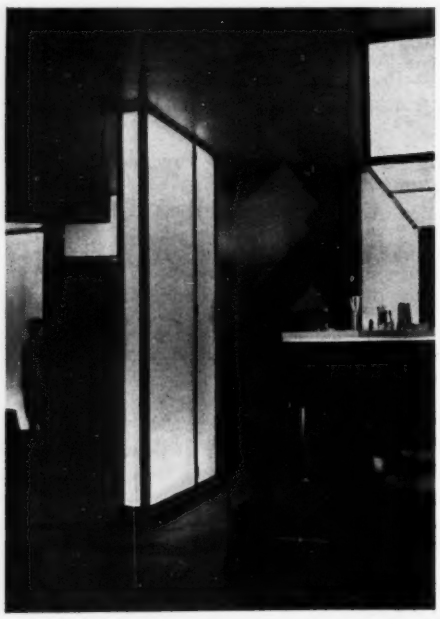


FIG. 1.—A corner of the *Bar Bergère*, showing use of diffusing-glass panels.

These three illustrations deal with a problem which, at first sight, does not present great opportunities for original treatment—the lighting of bars. In this country the lighting of the bar is usually treated on conventional lines, with a bright illumination, and not infrequently excessive glare from unscreened filaments. It is characteristic of the methods of our friends in France that they should introduce a certain degree of imagination into this problem; and, indeed, why not? The bar serves not only for purposes of refreshment but as a meeting place where friends can exchange ideas; the more we can emphasize this function of the bar by means of agreeable surroundings the less the likelihood that it will be used for drinking to excess.

The first of these pictures shows the lighting of a corner of the *Bar Bergère*. It will be noted that this installation illustrates the modern tendency towards the use of extensive luminous surfaces, light being derived entirely from panels of diffusing glass. A singular feature is the narrow vertical column seen in the foreground. The table itself is also made of glass and illuminated from below, a method which is also adopted in the next installation shown (Fig. 2), and which doubtless helps to emphasize the appeal of the bottles thereon.

Fig. 2, showing the lighting of the bar at the *Restaurant Chiquito*, again illustrates the use of diffusing-glass panels, but in this case highly decorative coloured glass is used. The lamps are again completely concealed, and no filaments can be seen.

The final illustration (Fig. 3) shows the application of indirect lighting, but the method is somewhat unusual, the lamps being mounted in a nickel-plated basket at the base of the "stalactite" descending from the centre of the dome in the ceiling. This basket contains eight 150-watt lamps, but additional 40-watt lamps are mounted in a cornice running round the edge of the central dome. A resulting illumination of the order of 100 lux (approximately 10 foot-candles) is provided, so that we have here an example of a relatively high illumination produced entirely by indirect means. In this case also the surfaces of tables are made of polished diffusing glass illuminated from below.

FIG. 2.—A view of the Bar of the *Restaurant Chiquito*, illustrating the use of decorative glass panels, through which light is diffused.

We think it will be agreed that these three installations mark a distinct departure in the lighting of bars, these restful systems of lighting being on quite different lines from the somewhat garish effects that are too frequently employed.

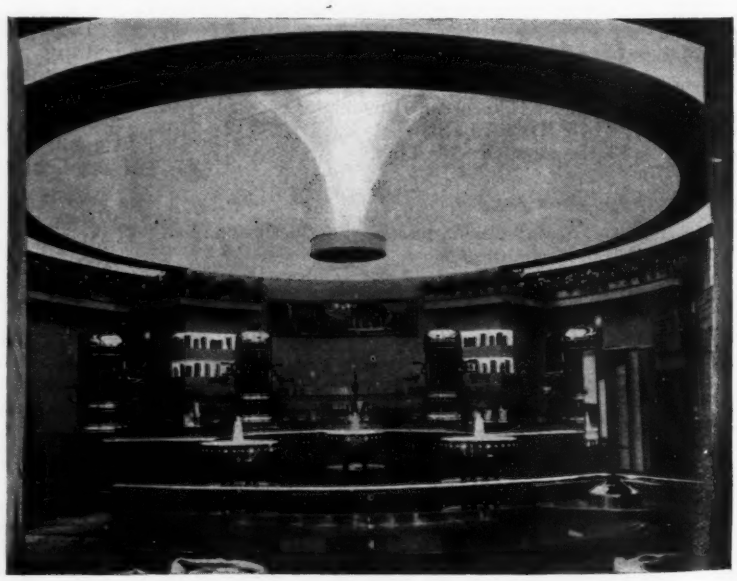


FIG. 3.—Showing the interior of the Bar of the *Compagnie Franco-Brésilienne de Cafés*; a novel indirect-lighting scheme.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

The Factory and Workshop Lighting Campaign

(Abstract of a Paper read by Mr. W. J. JONES at the First E.D.A. London Area Sales Conference on October 5th, 1928.)

THERE was an excellent attendance at the London and Home Counties Area Sales Conference on October 5th, over which Mr. Alexander C. Cramb presided. The evening was devoted to a paper by Mr. W. J. Jones, of the E.L.M.A. Lighting Service Bureau, dealing with the Factory and Workshop Lighting Campaign. The meeting was held in the lecture hall of the Bureau, at 15, Savoy Street, and the lecture was illustrated by numerous illustrations and small models demonstrating fundamental principles in industrial lighting.

In introducing his subject, Mr. Jones quoted a saying to the effect that each time an electrical engineer persuaded a factory owner to install an efficient lighting installation he "increases the productivity of the of the workmen and the quality of their output, reduces risk of accidents, makes the working conditions more healthy and more cheerful, and *pro tanto* adds to the industrial efficiency of the nation."

Work of the Home Office Committee.—In reviewing the progress towards better factory lighting during recent years, Mr. Jones took as his starting-point the reports of the Home Office Departmental Committee on Lighting in Factories and Workshops. In these reports the fundamental principles of providing adequate illumination and avoiding glare were emphasized, and recommendations were made regarding the minimum intensities desirable for various classes of work. Since the issue of these reports data have been accumulated showing the remarkable extent to which good lighting assists working efficiency. The outlook on industrial lighting has changed; we no longer think in terms of the minimum illumination necessary to render objects visible, but rather in intensities which we know can definitely bring about increased facility in working and greater safety. The whole question of factory efficiency is a national one. During recent years the Government has set up useful machinery for directly assisting industry through such agencies as the Department of Scientific and Industrial Research and the Industrial Fatigue Research Board, and the Home Office Industrial Museum, which includes a special section devoted to lighting. A section of the Home Office is directly concerned with factory and workshop conditions, and the report of H.M. Chief Inspector of Factories for the past year contains the following sentence:—

MR. W. J. JONES
(E.L.M.A. Lighting Service Bureau).
(By the courtesy of "Electricity.")

"Within recent years factory lighting has come to be recognized as a very important section of industrial hygiene, and the large amount of investigation and experiment that has taken place has established clearly that good lighting has a marked influence on the safety, health and comfort of the worker, and on the ease and efficiency with which the work can be done."

The campaign on factory and workshop lighting, which has been taken up so enthusiastically by all sections of the electrical industry, thus serves to supplement investigations which have taken place over quite a number of years. Meantime manufacturers have been responsible for much active propaganda work, and there are signs that this work is beginning to bear fruit.

The time appeared opportune for this campaign, in view of the mass of important data now available, and also because many industries are now in a better condition than within recent years. The campaign offers opportunities alike to the supply undertaking, the manufacturer, the distributor and the retailer, all of whom stand to gain by the movement.

A Survey of Lighting Conditions in Factories.—As in the case of previous lighting campaigns, the E.L.M.A. Lighting Service Bureau considered it desirable to make a survey of lighting conditions in this particular field. Accordingly an extensive investigation was conducted by Mr. J. L. H. Cooper, whose results were conveyed in a paper read before the Illuminating Engineering Society.* Mr. Cooper found that most employers agreed that inadequate lighting is a handicap to the worker, and expressed willingness to meet the wishes of workers in lighting matters. But in most cases there was lack of appreciation of the nature of good lighting. No less than 70 per cent. of the factories were considered inadequately lighted. The purposes of the modern reflector were imperfectly understood, and in some workshops bare lamps were installed, giving rise to glare and harsh shadows. In other cases shallow enamelled-iron shades were used with gasfilled lamps, new lamps being inserted in old equipment. In certain progressive establishments, however, the nature of good lighting was understood, and in some cases illuminations actually higher than those usually recommended by lighting experts

* See *The Illuminating Engineer*, January, 1928, pp. 5-15.

were in use. This survey showed that factory lighting offers a fruitful field for improvement, in which much remains to be done.

Better Lighting Improves Production.—Good lighting should be regarded as an investment which will pay handsome dividends in increased production, better work, less spoilage, improved working conditions and fewer accidents. Provided glare is avoided, the "saturation" point in regard to intensity of illumination is probably well above the values recommended by the most advanced advocates of better lighting. In many industries an increase in production of 1 per cent. would easily suffice to cover the cost of better lighting. (In this connection Mr. Jones presented the results of some tests showing that in various cases increases in illumination had resulted in production increases of 8.5 to 25 per cent.) The effect is naturally most pronounced in the case of manual or semimanual operations; but even in the case of work which is largely automatic good lighting yields useful results, for there are fewer stoppages and closer attention to the work. As an authoritative example of the influence of illumination on the efficiency of fine work Mr. Jones quoted the experience of the Illumination Research Committee in connection with printing work, when it was found that full efficiency, judged both in terms of output and freedom from errors, was only reached when an illumination of the order of 20 foot-candles was attained. From these experiments it appeared that an increase in illumination of from 2 to 20 foot-candles would lead to an increase in output of 33⅓ per cent., and the value of this increased production was sufficient to cover the cost of the extra light twenty times over. In practice the actual cost of lighting forms an almost insignificant percentage of the total costs of production. Poor lighting may cost about 1s. 8d. per day per worker, good lighting 1s. 4d. per day per worker. The cost of good lighting for one hour may be equivalent to the wages earned by the worker in 32 seconds. If, therefore, the hourly saving in labour is only 32 seconds, the lighting installation pays for itself.

Better Lighting and Accident Prevention.—The case for better lighting in the interests of safety is equally strong. Mr. Jones reproduced in diagram form the results of the investigation of the Home Office Committee showing that accidents are most frequent during the winter months. In many industries the accident rate by night is much greater than during the day—owing to the defective artificial lighting provided. Excellent lighting undoubtedly furnishes an important safeguard. Accidents constitute one of the hidden expenses of industry; it is impossible to assess their full cost, for, apart from personal injury, the loss due to the disablement of skilled workers and the disorganization of shop routine must be considered.

The Market for Modern Equipment.—The industrial survey quoted above showed that only 30 per cent. of the works visited employed modern equipment, and that even so nearly half of these were inadequately lighted. It may be estimated that 70 per cent. of existing factories require entire new equipment, and that in the case of a further 14 per cent additional lighting equipment is needed. The benefits of better lighting to the management and worker have already been indicated. From the standpoint of the electrical industry better lighting means (1) a larger market for electrical equipment, (2) more work for contractors, and (3) a greater sale of electricity by supply undertakings.

The Reorganization of the Campaign—Mr. H. Jones then outlined the organization of the campaign for better industrial lighting, which has been planned by the E.L.M.A. Lighting Service Bureau and is being conducted by the British Electrical Development Association, with the assistance of all sections of the electrical industry. Preliminary literature indicating the objects of the campaign has already been circulated. Since then an important booklet, "Factory Lighting Facts for Electrical Salesmen," has been distributed. This contains information, based on factory-lighting data obtained from official sources, which should prove an invaluable help to the sale of better industrial lighting. In order to promote uniformity in lighting schemes, a standard campaign specification has also been circulated. Five successive postal communications have been issued to 100,000 factories and workshops. With these letters postcards giving a list of booklets on special aspects of factory lighting are included, and recipients are asked to indicate those of special interest to them. The circulation of all this literature is being supplemented by a comprehensive "following-up" campaign.

Mr. H. Jones suggested a method by which all concerned can aid the campaign, e.g., by the formation of "circles," and by arranging lectures and demonstrations of good and bad lighting.

Lectures can frequently be arranged in conjunction with electrical exhibitions. Industrial lighting demonstrations, supplemented by suitable charts and diagrams, can be readily staged in showrooms. A feature of the campaign has been the organization of lectures to such audiences as welfare societies, factory owners, associations of works foremen, and organized groups representing specialized industries. It should also be borne in mind that there are many proprietors of small workshops, garages, etc., who are quite as much interested in the question of better factory lighting as the large factory owner.

Progress to Date.—In conclusion, the author gave a brief summary of the progress of the campaign to date. During the first few weeks over 800 enquiries for booklets, etc., have been received. Efforts are being made to induce factory managers to accept trial installations, and when a trial installation of modern lines is once installed it is very seldom taken out again. In one instance, in the Midlands, a trial installation resulted in the complete relighting of a factory, involving over 400 points. Mr. Jones remarked that this was not only an educational, but also a "business-getting" campaign. "We need have no fear in intensively supporting this campaign, for while we, as in industry, stand to benefit enormously, the advantage of better factory lighting from the point of view of the factory owners, executives and workers is immeasurably greater."

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A Visit to the Works of the London Electric Firm

FIG. 1.
A view of
the Factory
of the
London Electric Firm
at
Croydon.

IN the course of a recent visit to the works of the London Electric Firm the writer had an opportunity of appreciating the variety of special work that is being done in their works at Croydon. The two main activities, however, relate to raising and lowering gear and searchlights. The contact direction suspension gear for street-lighting fittings, etc., is now widely used. A feature is the ingenious method by which the central socket is guided into position. The gear and the winches operating it are robust in construction. Perhaps the best indication of their trustworthiness is their general use for centrally suspended lamps in the City of London and many other cities, the device being applicable alike to electric and high-pressure gas lamps. Other special apparatus made by the firm includes current-carrying cable drums, flexible couplings and worm reducing gear for small motors.

It was, however, the design of the variety of searchlights that chiefly interested us. Probably many people hardly realize the degree of accuracy demanded in the manufacture of operating gear for searchlights used for naval work. There must be practically no backlash, and the margin permissible in the angle scales is exceedingly small. One was specially interested in a couple of giant searchlights, now being manufactured for use abroad, with barrels approximately 7 feet in diameter. The design of these searchlights—probably the largest ever manufactured—involved many new problems. One observed the apparent simplicity of the operating gear and the smoothness with which the huge mass could be tilted and revolved, and our attention was drawn to many details of design necessitated by the large dimensions of these units. Distributed round the works were many forms of searchlights for special purposes. Attention has lately been concentrated on " super-efficiency " methods. We were given to understand that, owing chiefly to improvements in carbons, the adoption of sprays of air or alcohol are now scarcely necessary. Apart from military and naval uses, searchlights have now many applications. Special forms have recently been designed for the use of vessels passing through the Suez Canal; these are so designed as to give six hours' burning with a single pair of carbons, thus obviating the necessity for trimming during the run. Special types for lighthouse and aerodrome work are made. Headlight equipment is furnished for locomotives. A form of searchlight giving a diffused beam for studio work has been developed. Searchlights also now form part of the equipment of fire brigades.

Finally, we may mention yet another novel application —their use by prison authorities to facilitate supervision and guard against the escape of the captives. It is recorded that on at least one occasion recently a prisoner, who had overcome the guard and made off, was subsequently located by the searchlight beam and restored to captivity.

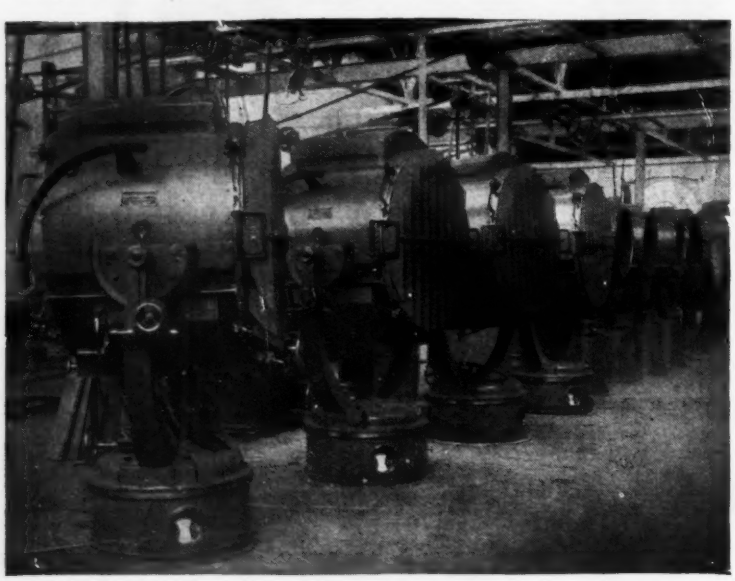

FIG. 2.—A battery of Searchlights being prepared for dispatch abroad.

Brief Items

Mr. H. Talbot has relinquished his position as General Manager of the Welsbach Light Co. Ltd., in order to assume duties as General Manager of the Non-Inflammable Film Co. Ltd.

Electricity Services Ltd. and their allied company, The Typerlite Co., have removed to more commodious premises situated at 86, Cannon Street, London, E.C.4. (Telephone No. : Mansion House 5294.)

We understand that Messrs. Metro-Vick Supplies Ltd. have coined a new word " Metrovication," as synonymous with modern electrification—an ingenious invention, but our dictionaries will have to be enlarged if other companies follow their example!

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"LUNAX" Glassware, developed after very extensive experiments, will be found far in advance of any other unit. It is a glass of extraordinarily fine lustre and uniform density. The absorption is extremely low, being less than 15%. "LUNAX" Units, correctly installed, produce an illumination of perfect diffusion and colour, with an entire absence of glare or shadows on the ceiling.

An untouched photograph taken by the light from "Lunax" Units

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Cast Ceiling Plate; $1\frac{1}{4}'' \times 9$ s.w.g. Oval Link Chain; Copper Gallery; Spun Copper Bowl Fixing Ring; High Quality Glassware with Transmission Efficiency of over 85%, as ascertained by the National Physical Laboratory.

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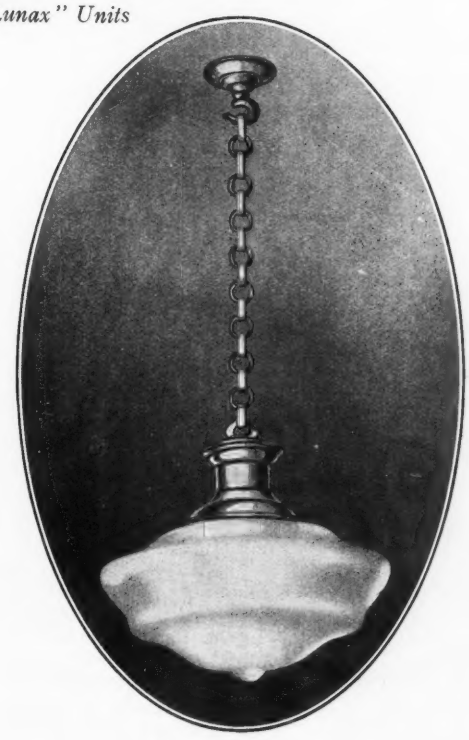

WRITE FOR CATALOGUE NO. 8—

Engineering & Lighting Equipment Co. Ltd.,

SPHERE WORKS, ST. ALBANS, HERTS

The E.L.M.A. Illumination Design Course

We understand that the eighteenth Illumination Design Course being conducted by the E.L.M.A. Lighting Service Bureau is proving quite as interesting and successful as previous efforts.

At the opening meeting, which was held at 15, Savoy Street, at 7-30 p.m., on Wednesday, October 10th, there was an audience of about 170 representatives of all branches of the electrical industry. The proceedings were opened by a brief address by Mr. C. A. Hughes, Vice-Chairman of the E.L.M.A. Sales Committee, who presided. After extending a hearty welcome to those present, he referred to the useful function exercised by these courses in keeping members of the industry in touch with the rapid development of modern lighting and in bringing its possibilities before the public.

Mr. W. J. Jones was then called upon to deliver the opening lecture of the course, entitled " Light and Visibility." Mr. Jones explained how the speed of perception increased with higher illuminations, and discussed the effects of glare and the important part played by contrast between objects and their surroundings. He showed, by the aid of demonstrations, that " eye efficiency " is directly affected by lighting conditions, and that, provided glare is avoided, the limit of the benefits obtainable from these higher illuminations has not yet been reached.

The second lecture, on October 17th, was delivered by Mr. W. Imrie-Smith, who dealt with " Illumination Design Data." The author explained the " lumen method " as applied to the general design of lighting installations. Each member of the audience was provided with a " Design Data Handbook (No. 2A)," and with a plan of a factory, enabling them to follow each step in the design as it was worked out by the lecturer. The completeness and simplicity of the method was explained by the aid of special demonstrations.

The third lecture of the course, on October 24th, dealt with " Lighting in the Engineering Industries," and was delivered by Mr. J. L. H. Cooper, who, it will be recalled, was responsible for a detailed statistical survey of industrial lighting conditions in a large number of factories in the Midlands.

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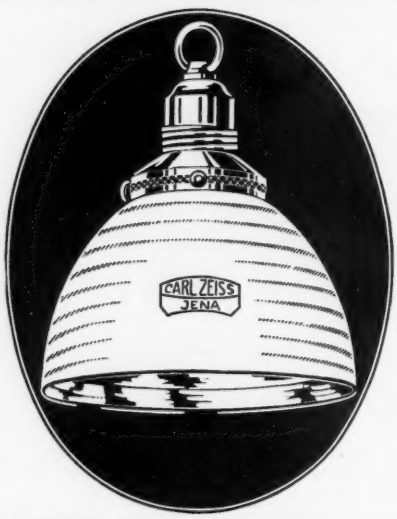

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NATURE OF WORK	ILLUMINATION INTENSITY FOOT CANDLES		PERCENTAGE INCREASE IN PRODUCTION
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SEMI-AUTOMATIC BUFFING	3·8	11·4	8·5
SOFT METAL BEARING	4·6	12·7	15·0
HEAVY STEEL MACHINING	3·0	11·7	10·0
SPINNING TEXTILE MILL	1·5	9·0	17·0
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The above table shows clearly how, under improved lighting conditions, production in a variety of industries was considerably increased.

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Illumination in Film Production

These two interesting illustrations, showing a scene staged at the well-known studios at Staaken, near Berlin, illustrate the large scale on which artificial light is often employed for film production. The upper picture was taken in such a way as to reveal the working methods; the lower one shows the effect produced. Attention may be drawn to the combination shown in the upper picture, batteries of projectors being hidden behind the first hill, and serving to counteract the shadows from the overhead lights.

In all such cases skilful combination of lights is necessary in order to avoid unsightly shadows. For this purpose many types of special arc-lamp projectors have been designed, some equipped with diffusing media and throwing a wide beam, others giving a concentrated beam for distant illumination. Many other special devices are available; for instance, small arc lamps are built into oil lamps and table standards, so that the light may be sufficiently actinic to enable them to be used in scenes of home life, etc.

Full particulars of a wide range of special apparatus for film-studio lighting are given in an illustrated list recently published by Messrs. Korting & Mathiesen Electrical Ltd., to whom we are indebted for the use of the above illustrations.

Shop-window Reflector. 500 watt size.

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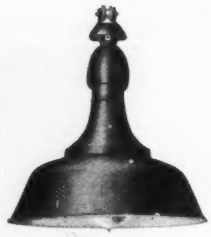

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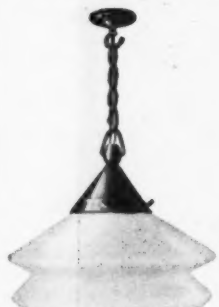

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The Romance of Artificial Lighting

An illustrated lecture on the above subject (based on a paper delivered by him to the Society of Engineers in 1926) was given by Capt. W. J. Liberty at the "Argyle Guild" at Bath, on Monday, October 22nd. Mr. J. Wesley Whimster (Engineer and General Manager of the Bath Gas Light & Coke Company) presided.

The author sketched the early history of artificial lighting, showing how great a part light has played in moulding methods, thought and religious observances. It was mainly to the East that one had to look for early illustrations of artificial lighting, e.g., the fire worshippers of the Babylonians, and Egyptian and Roman mythology. Old Japan, a museum of Oriental civilization, furnished many examples. Capt. Liberty displayed pictures of many early torches, splinters of resinous wood, etc., and traced the subsequent development of primitive oil lamps.

Early earthenware lamps, Roman and Roman-British, were described, likewise "cressets," "falots," "prickets," weavers' candlesticks, snuffers and tinder boxes, and old crusie lamps.

Capt. Liberty also traced the history of street lighting in London, referring to the days when Sir Henry Barton, skinner and Lord Mayor, formally ordained "lanthorns to be hanged out with lights therein in the winter evenings between Hollowtide and Candlemess." Curfew, besides deciding when men should retire to bed, also decided how much he could contribute to the public benefit by use of tallow—a duty which was avoided by many canny devices. So badly were the streets lighted in the days of Bluff King Hal that highway robberies were committed with impunity. "Hang up the thieves and let honest men stay indoors" was the King's advice, which was carried out so thoroughly that 72,000 are said to have been hanged during his reign.

The latter part of the lecture dealt with the era of gas lighting introduced by Murdock in 1792, and with the subsequent work of Winsor and the founding of the Chartered Gas Company. Gas lighting had a profound influence on social life, changing the habits of the people and helping to pave the way for a more liberal education. The advent of electric lighting in the 'eighties was next dealt with, and, in conclusion, the lecturer showed a number of examples of modern lighting installations.

Roads and Road Making

Mr. W. J. Hadfield, the Sheffield City Surveyor, recently gave a lecture before the members of the Sheffield Illumination Society on "Roads and Road Making."

The lecturer said that he did not intend to treat of the making of roads locally, but he would give a talk on the impressions he had received from a visit to Rome, Florence, Genoa and Milan, to attend the World Motor Transport Congress held at Rome recently, and these would be illustrated by lantern slides.

In the course of his most interesting remarks and admirable series of lantern slides he drew special attention to the general lay-out of the roads, the road surfaces, and in many cases the street-lighting units, in the various European countries through which he passed. Mr. Hadfield said that all the Italian towns and cities were excellently lighted, this being due to the cheapness of electric current in that country.

Mr. J. F. Colquhoun, the Sheffield Public Lighting Engineer and Hon. President of the Sheffield Illumination Society, presided over the meeting.

Beauty and Industry as Partners

In his Presidential Address to the seventeenth Conference of the British Commercial Association at York, on the 23rd October, Mr. Alfred Procter dealt with the subject of "Beauty and Industry as Partners." The full address forms fascinating reading, and must be read in its entirety to be appreciated to the full. It contained a message not only for the gas industry but for industry in general. Below are given a few of many striking passages:—

OUR general view of industrialism seems to indicate that, though it is easy for it to produce ugliness, it is not in the least a necessary accompaniment. Is not all industry directed towards greater prosperity and happiness in our everyday life? And is not beauty an essential factor in all happiness? Industry can only be defeating its own ends, therefore, if it is estranged from beauty; to divorce the two is unnatural and definitely retrograde. That is why it is not only expedient for us to cherish beauty; it is a solemn duty.

The Virtue of Pride in Work.—At this time, when industry touches the lives of all of us at so many points, it is more than ever necessary that we should realize the full extent of our duty in seeking after beauty. We have seen how fatally easy it is for industrialism to produce ugliness, but we can also see that it is only carelessness and lack of pride in our work which is the cause of this. For that is the great danger with our modern mass-produced goods, that we are apt to suffer by the loss of that pride lavished by the craftsman of old on his work. It is vitally necessary to retain this pride in our creations, the pride, for instance, of the old guilds in their products. And pride is largely a matter of tradition.

* * *

The Standardization of Beauty.—Undoubtedly some of the early machine-made things were completely lacking in artistic merit; that they were also lacking in utility goes almost without saying. Birmingham poured out a flood of brazen "Oriental" atrocities, and Staffordshire did its worst in ornamental china. But happily manufacturers have realized that, as the standard of education is higher at the present day than ever before, so is the standard of taste. The cheap and ugly product no longer sells. Consequently we have our great industries seeking out the finest artists of the time to design for them. The gas industry has realized the necessity for using only the very best designs. A beautiful thing is none the less beautiful because it is one of many equally beautiful things; rarity is a quality which appeals to the collector, but the true lover of beauty wishes to see it everywhere. Standardization means, above everything else, that beauty can be widespread and accessible, no longer the prerogative of the wealthy classes. And for that we ought to be profoundly grateful.

* * *

In my attempt to visualize the application of beauty to an industrial age I do not mean by that term what is sometimes called by artists mere "prettiness"; still less do I mean ornate design or mere meaningless decoration to cover up what is fundamentally poor in the general conception. Beauty to fulfil its function must be inherent in both the soul and the body of any work; as in God's handiwork, so also in man's. If beauty be an afterthought—something *added*, or some*thing serving no real purpose*—then the result is either the whited sepulchre or the barren fig tree: either a static thing pretending to be clean and fair when it holds within itself the elements of decay and dissolution, or a living and growing thing which puts out, as mere pretence and adornment, the covering which should shield the life-giving fruit, and which but tempts and then deceives the hungry and thirsty traveller, who approaches not merely for shelter and repose, but for nourishment and refreshment.

In short, let me say once again that where there is *pretence* in place of *truth* there is no beauty. Beauty and industry, then, must be partners in the mystic sense of perfect marriage; so that the result of their union is not merely a repetition of the one or of the other; but something which is the happy product of both; something new, something vital, something that did not exist before the partnership.

* * *

I have tried so far to postulate, not a utilitarian idea of beauty, but a beautiful idea of utility. If this is understood, as I hope it is, I may suitably discuss the æsthetics of a great public utility—the gas industry. No one will disagree with me if I say that our industry, while its functions are utilitarian, has as its chief mission one which is fundamentally æsthetic. I must do more than make a passing reference to this mission—the abatement of smoke—if I am to show substantial reasons for regarding the functions of the gas industry as being even utilitarian.

Sunlight or Smoky Gloom?—I will approach this subject by the avenue of quotation, my authority being Sir Frank Baines, speaking as Director in H.M. Office of Works. "To-day we see the nation existing as under a cloud, raised, shall we say, by its own restless, unremitting and brilliantly successful industrial exploits. In its great centres of population it lives in the gloom of its smoke and fogs, peering out upon nature, inexpressibly defiled by the results of its very virtue of unceasing industry; and perhaps regretting, in its periods of quiet thought, its forfeiture of its common birthright, clear sunlight and sweet air."

* * *

The Responsibility of Local Authorities.—A medical officer of health, Dr. Moore, of Huddersfield, lately dealt broadly with the problem of smoke abatement at the Annual Congress of the Royal Sanitary Institute held at Plymouth. After discussing the opportunities afforded to local authorities in dealing, by education, with the open fire grate, he gave it as his opinion that there was an even greater opportunity for reducing the smoke evil where new estates are springing up, and where it is possible to introduce smokeless appliances for heating and cooking. "The gas industry," he said, "has been an enormous factor in reducing the smoke evil of great cities. Reputable British makers have caused prolonged scientific researches to be made into the whole question of gas heating, and the results are seen to-day in serviceable, scientifically constructed equipment that can be safely used without the slightest detrimental effects to health. The good modern gas fire heats adequately and assists in healthful ventilation, and for these reasons it must be given an important place in the heating arrangements of new housing schemes."

The North Sets an Example.—I think I may say that Scotland and the Northern counties are showing a remarkable example to the rest of the kingdom by their enterprise in dealing with the domestic smoke problem. In regard to old houses equipped with open fire grates and coal ranges, borough and urban councils throughout the West Riding, in the South of Yorkshire, and in the populous districts around Manchester are urging the public to substitute smokeless fuels—solid or gaseous—for raw coal. In new housing estates provision has been made either for the encouragement of the burning of solid smokeless fuel, as in the case of Hull, or for the installation—on a scale hitherto unattempted—of gas fires, cookers and water-heaters, or of electrical appliances in districts where the price of electricity makes it an economic alternative.

The Regional Smoke Abatement Committee of the West Riding of Yorkshire has recently invited the hundred local authorities affiliated to it to forward information showing precisely what has been done in their respective areas. This information has now been assembled in the shape of a report. The following extracts typify the vigorous policy now being pursued in the West Riding:—

Leeds, 1926–27.—One thousand two hundred and fifty-one houses erected by the Corporation are provided with gas fires in all rooms except the living room, where a coal fire is provided, together with a fire-back boiler. The scullery contains a gas cooker and gas copper. Twenty-four of these houses have also secondary means of heating the water required for the bath and lavatory by gas, in addition to the fire-back boiler.

Bradford.—Five thousand houses have been erected, all of which are heated by gas, with the exception that in each house there is one coal fire in the living room.

Halifax.—Seventy-five per cent. of houses erected by the Corporation are provided with gas cookers. Eighty per cent. of the houses are provided with gas fires in the bedrooms. In 25 per cent. of the houses combination stoves have been fitted which will burn either coal or coke.

I do not wish to imply that the South is behindhand in this movement. It would not be feasible to give an exhaustive account of what is being done all over the country in the equipment of new dwelling-houses, of which 470,000 have been completed during the last two years alone.

* * *

Fittings and Fitness.—I have shown that an essential part of classic design, which in its best period stands above reproach, was fitness and adaptation to the purpose required. Surely, when we come to consider the fittings of houses, as when we consider their design, beauty is of little value unless accompanied by utility.

That also is the test to apply to all designs of gas appliances. Certain standard dimensions and other requirements have been laid down by the gas industry after years of research and investigation, simply and solely as securing the highest possible degree of utility and efficiency in the gas apparatus in question. Within those limits the designer has a free hand to achieve beauty and simplicity. Gas fires can be and are designed so as to be both useful and beautiful; in that, while serving the primary purpose of heating the dwelling and assisting in ventilation, they at the same time can be made to harmonize with any type of house from the cottage to the mansion, and with any style of interior decoration and furniture through all the periods. They are useful in that they perform the work for which they are designed with the maximum of hygiene and efficiency and with the minimum of cost.

We as an industry are proud of the fact that a President of the Royal Institute of British Architects has turned his attention to the design of gas fires. I refer to Mr. Walter Tapper, A.R.A., who, we are also proud to record, is consulting architect to York Minster. Twenty-five years ago we should not have thought of approaching an architect of distinction for his help in such a matter, and I dare say he, for his part, would not have cared to associate his name with mass production had we done so.

* * *

Advertising Service.—Generally speaking, we are advertising service. I do not mean that some nebulous philanthropic spirit governs our dealings — though there is more philanthropic spirit in British commerce to-day than many people would suppose—but that there is a definite policy of interest in the special circumstances of our consumers, followed by careful catering for their needs.

I call it a " policy of *interest* because it is essentially a matter of good business. We hear a great deal about " service " nowadays, in many and varied branches of commerce, from motor-cars to furniture; but " service," as I understand it, means two things, both of which are quite distinguishable from the spirit of goodwill in which we hope and endeavour to do our business, and neither of which has anything to do with the " something for nothing " idea. These two things, which together make up the gas industry's service, are given in greater or less degree by every gas undertaking. The first is given by the gas itself; and the second is given by the representatives of a gas undertaking whose business is to study a consumer's needs.

Personal Beauty and Health.—Gas comes into our homes, meets those needs, and enables all of us to live more fully. It does this, as I have shown, by lessening the amount of smoke, and so bringing sunshine into the home; and also by saving fatigue, by removing all the drudgery and unpleasant tasks which are inseparable from the home which relies for its fuel needs on raw coal. In the modern home, where gas is responsible for good and clean cooking, for a ready supply of hot water, for even and constant warmth, for the destruction of refuse and for refrigeration, who will deny that the housewife has both a pleasanter and an infinitely lighter task than the housewife of a generation ago? The influence of the greater cheerfulness and greater leisure in the home is more far-reaching than may at first sight appear. For with her greater leisure the young wife can keep her personal beauty and can also continue her intellectual interests, which were under old conditions so often allowed to lapse after marriage, because a housewife's time was wholly occupied with domestic cares. Our industry can say with justifiable pride that it is responsible for an enormous amount of happiness in the home.

* * *

I have only barely summarized some of the services which the gas industry has to offer. My object in doing so at all has been merely to show that when we advertise gas we are advertising health, comfort, simplicity, leisure—anything but a mere commodity.

Beauty in Advertisement.—The task, therefore, or rather the duty, of producing advertisements which are not vulgar or blatant is made, in a sense, all the easier for us. But I think we may take credit for doing something more than merely avoiding the pitfalls of vulgarity or blatancy.

The advertiser has a privilege denied to the statesman—he may go in advance of public opinion. One might almost say that he *must* go in advance of public opinion if he is to reap success; but he must equally go in some degree in advance of public taste. His advertisements should, and can, educate the vision as well as the mind, so that the public will accept the feeling of an advertisement as they accept its message. When this state of affairs is reached we shall be able to say with truth that advertising is an art.

* * *

The Gas Industry's Lead.—We, the gas industry united for service, were the first British industry organized on co-operative lines. We, the gas industry united for propaganda, were among the first British industries to employ the services of Royal Academicians and other artists of first rank to draw and paint for us. I am not forgetting " Bubbles," but the outcry which occurred among artists and among the public when a firm of soap manufacturers made a bold and glorious attempt to introduce art and beauty into ordinary commerce will still be fresh in the minds of some of us. Our Association, by making the employment of fine artists an article of faith and the instrument of a considered policy, did much to still the murmurings that remained and to turn indignation into gratitude.

Our industry, again, was the first organized national industry to employ highly trained writers of university and technical standing to draft our copy, to write our articles and pamphlets, and to control that clearing house of facts relating to our part of the fuel industry which has been of such immense service both to the industry itself and also to the Press when co-ordinated information was nowhere else available.

* * *

Our great ideal is the service of the community, and to realize that ideal we have put both science and art under contribution. It is our belief that we have played *—and have still to play—* a not insignificant part in making the world a happier and a more beautiful place. For though in this address I have dwelt at some length on the *achievements* of the gas industry—achievements of which we may well be proud—yet I do not want you to think that there is little left to do. Each of our conferences is in its way a milestone on the road towards that ideal of which I have just spoken; and, like all milestones, it must mark the miles yet to be undertaken as well as those which are passed. In these annual conferences we take stock just as much of ideas as of finance, and though it is necessary to review the past, it is even more necessary to look towards the future.

The mediæval pilgrims to Canterbury had achieved their goal when they reached that city; for you modern pilgrims to York there is no such finality about your brief visit. But I hope that the three days to be spent in meeting and deliberating with your fellow-members, in this our beautiful city, will inspire you to go forward with renewed hope and confidence on yet another stage of your journey towards a noble ideal.

THE GAS INDUSTRY IN ITS RELATION TO PUBLIC HEALTH.

Address by Sir William Arbuthnot Lane.

In a speech on the evening of the 22nd October to the seventeenth conference of the British Commercial Gas Association at York Sir William Arbuthnot Lane dealt with the many ways in which the gas industry is doing notable service in the cause of public health. Its services, he said, might be divided into three groups—domestic, industrial and national.

In the home gas fires, gas cookers and gas water heaters had revolutionized the whole problem of kitchen management. Gone was the drudgery which was inseparable from the old-fashioned method of using solid, smoky fuel, and now the housewife had some precious leisure, time to get out into the fresh air, opportunity to live a life which was not that of a mere household drudge; in short, she had the emancipation which means health and happiness. Her food was not only cooked scientifically, but she was enabled, through the newest service performed by gas—namely, refrigeration —to keep her food pure, wholesome and appetizing. and because the gas incinerator and the coke-refuse destructor are available, she need no longer leave putrescent refuse about in an insanitary way to await the dustman's visit. Organic matter, added Sir William, both in household and factory refuse, *should be forbidden by law.*

Referring to industrial conditions, he said that the time had passed when working in a factory connoted an unhealthy mode of life, and in bringing about this change none had played a larger part than the gas industry. The worker now had good, cheap, well-cooked meals provided for him at the works canteens; the atmosphere in which he worked was much more temperate and less contaminated than formerly, owing to the ventilating properties of gas fires and gas lamps, and owing also to the substitution of gas furnaces for the old coal-fired type for manufacturing purposes.

Probably the greatest service the gas industry had performed for the nation was in the abatement of smoke, with the enormous consequent gain to the people in increased sunlight and purer air. Not only did the industry ensure a purer atmosphere but purity of food also, by refrigeration, milk sterilization and pasteurization. Finally he pointed out that the gas fire is eminently suited to our English climate and our English tastes. We need to have a method of heating which is *flexible*, and a fire of living flame, free from smoke and with a ventilating flue. Only a gas fire, he said, fulfilled all these requirements.

King's College, London

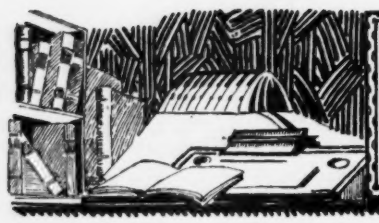
Appeal for Centenary Fund.

King's College, which forms part of the University of London, is this year celebrating the Centenary of its foundation, and an appeal is being issued for £350,000 to enlarge the College and provide a much-needed endowment. About £100,000 is needed to endow special chairs and studentships in physics, physical chemistry, electrical engineering and physiology—objects which we are sure will command the sympathy of readers.

The College is now acquiring a 200 years' lease of an adjacent site in Aldwych. The rebuilding of the south-east block (which is illustrated by a picture of the design by Mr. F. W. Troup, F.R.I.B.A.), will remove what is, architecturally, felt to be an eyesore and will facilitate bringing the various sections of the medical department together.

The booklet before us outlining the scheme contains, as an appendix, an interesting sketch of the history of King's College, which illustrates how the work has grown from quite small beginnings.

Contributions to the Appeal Fund should be forwarded to The Treasurers, Centenary Appeal Fund, King's College, Strand, London, W.C.2.



REVIEWS OF BOOKS AND PUBLICATIONS RECEIVED

STAGE LIGHTING, *by C. Harold Ridge, A.R.S.M., D.I.C., etc.* (*W. Heffer & Sons Ltd., Cambridge,* 1928; *pp.* 201, *figs.* 74. 12*s.* 6*d. net.*)

In his preface to this work, a sequel to Mr. Ridge's earlier book, "Stage Lighting for Little Theatres," Mr. Norman Marshall emphasizes the need for genuine *theatrical* criticism. Critics, and the public influenced by them, are prone to consider only the play and the acting. It is rare for intelligent criticism of the stagecraft and production, including the lighting, to appear. True it is that "the play's the thing," and the acting no doubt comes next. But as Mr. Ridge rightly points out, good acting can only be enhanced by suitable scenery and beautful lighting. It is a crime to spend time and money on scenery or lighting to the neglect of the acting. And it is also a crime to stage a bad play simply because it lends itself to spectacular effects. In the Little Theatre, the amateur company has one obvious advantage—the salaries of the actors do not affect the issue and money spent on lighting or scenery does not detract from the efficiency of the acting. Yet the funds of the amateur company are limited, and there is every inducement to secure effects by originality of design and method, rather than by costly expenditure. Mr. Norman Marshall pays a well-deserved tribute to the amateur whose work is commonly marked by a degree of joyous enthusiasm that is perhaps less omnipresent in the commercial theatre. Theatrical experts who read Mr. Ridge's book cannot fail to find many stimulating suggestions, whilst the novice will gain some insight into the underlying principles of modern stage craft.

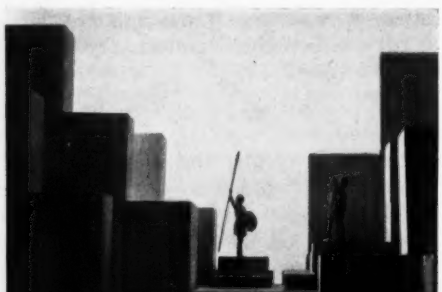


FIG. 1.—Showing a simple but effective display. The high lights are of a different colour to the shadows.

Fig. 2.—Here natural shadows and high lights are superimposed on the normal lighting by powerful-focus lamps outside the windows.

The first four chapters deal with lamps and lighting equipment, wiring systems, etc. Much of this will probably be familiar to lighting experts. The subsequent chapter on "Costs" will be a useful one to anyone contemplating theatre equipment. Chapter VI, dealing with principles of stage lighting is a particularly interesting one. The history of stage lighting may be paralleled by experience in other fields. The abundant facilities furnished by the introduction and continuous improvements in electric lighting are still not infrequently misused. Indeed the author remarks that some of the early gas lighting, as used by Irving, would compare favourably with much electric lighting seen on the London stage to-day. Such crude defects

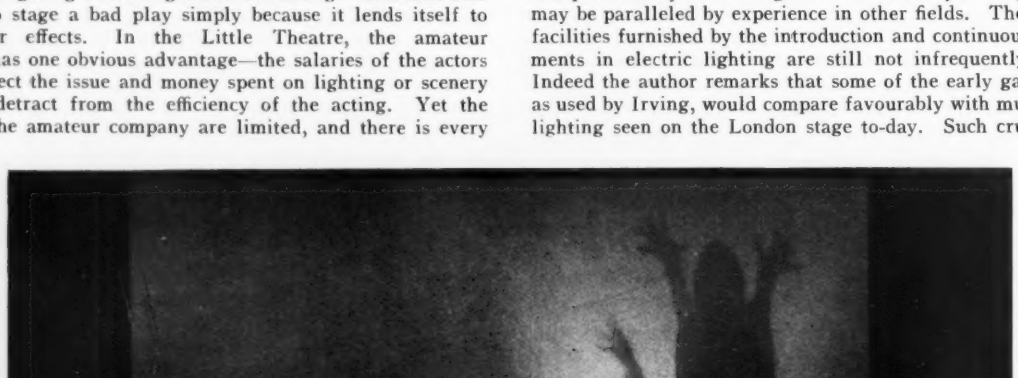


Fig. 3.—A scene from King Richard III.

"Let me sit heavy on thy soul to-morrow!
. . . . And fall thy edgeless sword: despair and die!"

Fig. 4.—A Silhouette Effect. ("And in the tomb were found . . . ." By Terence Gray.)

as excessive glare and obviously erroneous shadows the student of stage lighting quickly learns to avoid. But the full treatment of shadows and colour is a more subtle problem. In interiors strictly correct shadow-effects may be difficult of realization, and in the case of open air natural shadows are almost impossible except in very large theatres. Efforts should be made to "balance" the components of the lighting system. The use of coloured light requires special skill and the author contributes some useful notes on the effect of tinted light impinging on coloured surfaces. Underlying stagecraft and methods of stage lighting there is the outstanding question how far it is possible or even desirable to achieve complete imitation of natural effects, and to what extent the production should be symbolic—making an appeal to the imagination of the audience and creating an atmosphere by means which only the designer may completely realize.

The chapters dealing with theatre design, methods of presentation and the theatre of the future will naturally appeal chiefly to earnest students of the drama, but even to the casual playgoer they will be found arresting. The discussion of methods of presentation, which is aided by many effective illustrations, is particularly interesting. By the courtesy of the publishers we are reproducing a few typical pictures which will give an idea of the effects ingeniously obtained with quite simple equipment. We should like to draw attention particularly to the scene in Richard III (Fig. 3), where a shadow cast on the background is deliberately utilized to emphasize the effect of doom!

THE INSTALLATION OF ELECTRIC LIGHTING AND HEATING, *by F. H. Taylor, A.M.I.E.E., A.M.I.Mech.E.* (*Chapman & Hall Ltd., London,* 1928; *pp.* 150; *figs.* 154; 7*s.* 6*d. net.*)

There is need for an up-to-date treatise on electrical installation work, and Mr. Taylor's book, though of modest dimensions, should prove useful. The treatment is simple and concise, and a liberal use of illustrations has been made. The book is divided into six sections, dealing respectively with conductors, systems of wiring, accessories and their uses, lampholders, adaptors, fixing blocks and connectors, fuses and distribution boards, the testing of a completed installation, the planning of a lighting installation, and electric heating and cooking. The greater part of the matter is contained in the first three sections, and some of the later sections are very brief. We confess that we should like to see a little more space devoted to "The Planning of a Lighting Installation" in the next edition. At present only three pages are allotted. The advice, so far as it goes, is sound, but one would welcome a little more guidance given on such points as the desirable intensity of illumination, the allocation of lighting points and the selection of lamps and fittings, though we recognize the great difficulty in compressing such advice into moderate limits.

R. E. CROMPTON; REMINISCENCES. (*Constable & Co., London,* 1928; *pp.* 238; 14*s. net.*)

Colonel Crompton's "Reminiscences" afford a picture of a long, interesting and extraordinarily varied life. Colonel Crompton was associated with the earliest beginnings of applied electricity in this country—with those wonderful days when the perplexities of electrical engineering were being unravelled, and every day brought some strange experience or new discovery. He was born in 1845, and recalls as a thing of yesterday the Great Exhibition of 1851. As a boy of eleven he served in the Navy, and was present in the trenches of the Crimea; surely one of the most singular introductions to school life, for it was only after his Crimean experiences that he commenced his education at Elstree and Harrow. Throughout his life he was associated alternately with military duties and engineering. His Army experiences in India quickly led to his design of the road engines adopted for transport in that country. His reminiscences include an arresting account of his experiments in this field in England, when he drove (in 1871) his vehicle from Ipswich to Edinburgh. It was in 1878 that he became attracted to electrical engineering and started the famous firm of Crompton & Co. During the following years he was associated with many electrical installations all over the world. There is a delightful account of his work at the Ring Theatre in Vienna, and of the deep interest and curiosity with which the old Emperor Francis Joseph watched his proceedings. Subsequent experiences in Belgrade and Sofia give some idea of the extensive pioneering work carried out by British engineers in distant lands in those early days.

Colonel Crompton also took an active part in the development of the electric lighting industry in England in the latter years of the nineteenth century. The great part which he played in creating and leading the corps of electrical engineers which served in the South African War will not soon be forgotten. In later years he returned again to the problems of road transport. He was responsible for much of the valuable pioneering work of the Road Board, and shared in the development of the tanks during the Great War. His interest in locomotion took a characteristic turn when, in 1895, he became an ardent cyclist and designed his famous bicycle with 9½-in. cranks; and he thought nothing of covering 200 miles in a day.

Colonel Crompton might be described as an engineer by instinct, but much of his success has been a triumph of personality. His long and varied career reveals an extraordinary aptitude for getting on good terms with those in authority and inducing them to accept his ideas. At his works at Chelmsford, where he was known as the "Guv'nor," he gained the respect and affection of all those working under him.

We commend this fascinating book to the notice of readers. To engineers of all kinds it makes a special appeal; but even those quite unfamiliar with engineering—if in these days such people still exist—must take pleasure in reading these reminiscences and feel something of the glamour attaching to the efforts of a great pioneer and the birth of a great industry.

TRADE NOTES & ANNOUNCEMENTS

STREET LIGHTING WITH SIEMENS SILVALUX OPAL LAMPS.

The accompanying illustration (Fig. 1) shows a night view of a street in Sheffield illuminated with Siemens " Silvalux " gasfilled lamps, in connection with the recent convention of the Institute of Public Lighting Engineers. This type of lamp is being increasingly used for street lighting and it may be mentioned, as a notable example, that the City of Bradford has equipped nearly 2,000 points in its street-lighting scheme with Siemens " Silvalux " lamps.

FIG. 1.—Showing a Street in Sheffield illuminated with Siemens " Silvalux " Gasfilled Lamps.

The illustration conveys a good idea of the even illumination on the street level and the whole of the bulb operates as the source of light, a circumstance which is very helpful in eliminating glare. In addition the diffusing properties of the opal bulb improve considerably the light-distribution in a horizontal direction.

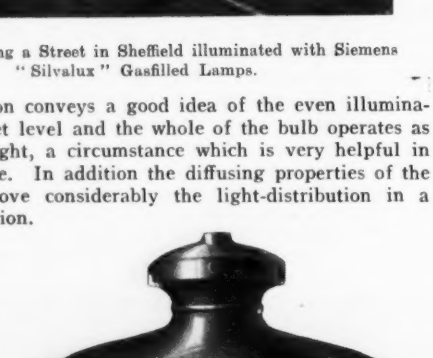


FIG. 2—A view of the New Street Lighting Fitting designed for use with " Silvalux " Lamps.

The other illustration (Fig. 2) shows a new type of fitting which has been developed by Siemens Electric Lamps & Supplies Ltd., specially for use with " Silvalux " lamps. The fitting consists of a cast canopy surmounting a vitreous enamelled reflector of special curvature designed to assist in the distribution of light at an angle of approximately 15° below horizontal. This fitting can be supplied in two sizes, one suitable for 100- and 150-watt lamps and the larger size for 300-watt lamps. The larger fitting is equipped with a clear-glass cylinder which protects the upper surface of the lamp bulb from any driving rain. This cylinder has a negligible absorption factor, so that the overall efficiency of the complete unit is of a very high order.

This type of unit affords an excellent method of street lighting at a relatively low expense, the fitting being cheap in first cost and maintenance expenses very low. We understand that the use of " Silvalux " lamps for street lighting is rapidly increasing, due to the excellent results obtained and to the relatively low capital expenditure entailed.

ANOTHER EFFECTIVE PETROL SERVICE LIGHTING INSTALLATION.

We recently commented on the importance of attractive exterior lighting for the petrol depots now being established at intervals on all important main roads in this country. To the motorist it is of obvious importance that such depots should be prominent features by night, and there is no doubt that effective illumination is a powerful aid in attracting custom. We are indebted to the General Electric Co. Ltd. for the accompanying view of the Ironbridge Service Depot, Southall. The approaches to the station are illuminated by floodlight projectors mounted on columns about 27in. above the surface of the road. The projectors are of the G.E.C. I.E./2/620 type

Showing the appearance by night of the Ironbridge Service Depot, Southall. (Untouched night view.)

and are equipped with 200-watt white Osram lamps to give wide lateral illumination, and are also fitted with hoods to direct the light on to the runways. Thus cars can enter and leave the station without casting shadows or risk of collision with the columns. The side walls of the building are rough cast and are illuminated by 100-watt Osram gasfilled lamps in I.E./2/113 floodlights mounted in the flower beds. " GECo " vitreous enamelled steel dispersive reflectors, fitted with 200-watt white Osram lamps, are also recessed into the false ceiling over the covered portion of the roadway, into which cars are driven for supplies of petrol. A special sign indicating the word " Petrol " appears on the roof. Mr. A. J. Perkins, of Hanwell, was responsible for the installation, which presents novel features. We understand that the proprietors (Messrs. A. J. Perkins and C. P. Abbott) have found that the efficient illumination has had excellent effects on business. About 75 per cent. of the business is of a " casual " nature, but they have opened some 200 credit accounts during the period of two months.

HOLOPHANE ILLUMINATION IN THE WORKS OF MESSRS. LUCAS, BIRMINGHAM.

We recently referred to an attractive leaflet issued by Messrs. Holophane Ltd., dealing with the lighting of Crittall's Model Factory. A similar leaflet has been issued dealing with the works of Messrs. Lucas, Birmingham, in which Holophane units are installed. An excellent photograph, taken by artificial light, illustrates the conditions of illumination in the general machine shop, where much fine work is done and good lighting is most essential. An illumination of the order of 10 foot-candles is provided. Another picture shows the use of Holophane reflector-refractors in a large office.

Such leaflets, illustrating the lighting of important factories throughout the country, serve a useful purpose in impressing other manufacturing concerns with the benefits of good illumination.

A CATALOGUE OF ARTISTIC ELECTRIC LIGHTING FITTINGS.

A catalogue recently issued by Lighting Trades Ltd. (incorporating Messrs. J. & W. H. Smith Ltd.) illustrates the trend towards more artistic and varied effects in lighting fittings. The catalogue is a comprehensive one, and all the usual period candle brackets, adjustable pendants, portable standards with silk shades, etc., are illustrated. There is also a good range of totally enclosed diffusing units and bowls,

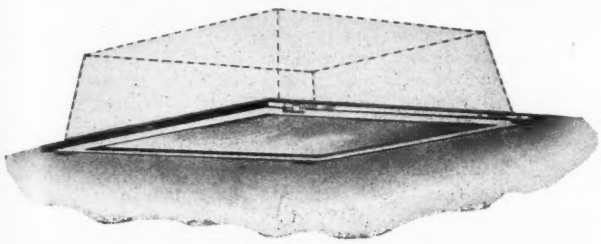


FIG. 1.—Semi-concealed Ceiling Fitting.

some of ornamental design. We may single out for special mention the Triplex units, which carry a moulded diffusing-glass bowl with a simple white glass reflector. At the conclusion of the catalogue there are given particulars of industrial units, watertight fittings, etc., from which we have selected Fig. 1 as an interesting type provided with a special ring to obviate glare.

The items shown in the architectural fittings section are more original. The range of ceiling fittings, of which Fig. 2 is a typical example, illustrate the modern tendency towards the use of diffusing panels of low luminosity, and the other ceiling fitting shown (Fig. 3) is of recent and novel design. This section of the catalogue also contains examples of the pressed Parisian glass fittings of recent introduction, which are capable of very pleasing effects, and are likely to become distinctly popular.

THE "KANDEM QUARTERLY REVIEW."

We have been favoured with a copy of the "Kandem Quarterly Review," which is issued by Messrs. Korting & Mathiesen Electrical Ltd., for October (No. 4, Vol. I). This issue is, very appropriately, devoted mainly to industrial lighting. There is an introduction emphasizing the benefits of good industrial lighting, and illustrated articles follow dealing with various problems in factory lighting. Figures are quoted to show that in various processes increased lighting costs of only 0.5 to 2 per cent. led to increases in productive power of 4 to 12.5 per cent. A feature is the series of illustrations of adjustable local units. There is a tendency now to recommend overhead lighting for most industrial installations, but there are many occasions on which this might with advantage be supplemented by well designed local lighting for close work.

THE "BENJAMIN REFLECTOR."

The October issue of this booklet, which likewise deals with factory lighting, is designed on novel and effective lines. The leading article is entitled "Twenty Years' Service—Essentially to Better Factory and Workshop Lighting," and the inside pages, entitled "Organization—Research—Service—Co-operation," are highly effective. The issue is opportune as a reminder of the twentieth anniversary of Messrs. Benjamin Electric Ltd., to which attention was drawn in our last number.

SHOW-WINDOW LIGHTING DEMONSTRATION IN LINCOLN.

We understand that the stand of the British Thomson-Houston Co. Ltd., at the Lincoln Corporation Electrical Exhibition, held during October 20th-27th, was devoted to an attractive display of shop-window lighting. A feature of the demonstration was the use of automatic colour changing by the aid of twenty-four 200-watt Mazda gasfilled lamps in X-ray reflectors, fitted with blue, red, and amber colour screens, and operated by the B.T.H. colour mixer.

CONTRACTS CLOSED.

METRO-VICK SUPPLIES LTD. :—

City of Westminster Union; for Cosmos electric lamps, etc., for a period of 12 months from October 1st, 1928.

FIG. 2.—A Special Fitting to Obviate Glare.

FIG. 3.—A Pleasing Nickel-plated Ceiling Fitting with Satin-obscured Glass Panels.

SHEFFIELD ILLUMINATION SOCIETY.

The members of the Sheffield Illumination Society spent an enjoyable evening at the premises of the Corporation Lighting Department, Corporation Street, on the 15th October. A whist drive was followed by musical items, and prizes to the whist winners were presented by the President of the Society, Mr. J. R. Hall. Messrs. W. Newcombe and Percy Twigg acted as M.C.'s, and were responsible for the function.

The event was the first one this season in connection with the Society.

R. E. CROMPTON

Reminiscences

Demy 8vo. **14/-** net.

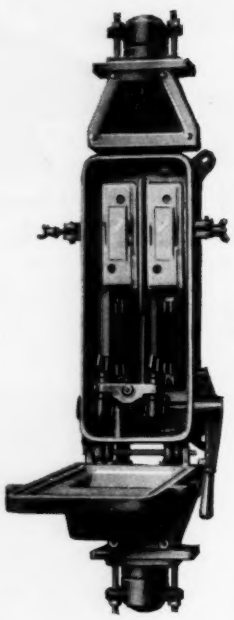
Electrical Review.—"To electrical men especially this volume is of interest, for it traces the history of the electricity supply industry from the very early days up to the end of the last century, a period during which the author played a leading part and exercised considerable influence on the course of events. . . . He has written a very interesting and a very human book, full of historical information and eminently readable . . ."

CONSTABLE: 10 Orange St. W.C.2

Messrs. Lewenz & Wilkinson Ltd., engineers, 25, Victoria Street, S.W.1, advise us that Mr. E. R. Wynne has resigned his seat on the Board of the Company, and that Mr. Cyril W. Davson, A.M.I.Mech.E., A.M.Inst.P.T., joined the Board of the Company in February last.

A NEW MOVEMENT FOR AIR-BREAK SWITCHGEAR.

An improvement in the design of modern air-break switchgear is noticeable in the new movement which is utilized by Messrs. Heyes & Co. Ltd., Wigan, in their new range of watertight switchgear.



The illustration shows a D.P. unit which is positive in operation. The operating spring of the switch is only in tension when actually being operated, thereby always ensuring a quick and efficient break. There are two breaks per pole and ample contact area is provided. These, combined with the new movement, form a switch capable of interrupting the comparatively heavy currents which are sometimes required to be dealt with. Arc shields are fitted between poles, and the fuses are of the easily rewirable type. The whole is housed in a cast-iron case with a fully interlocked cover. Two- or three-pin and earth-pin plugs and sockets may be fitted, forming a unique design of switch-fuse plug. Also the switches may be built up into distribution panels suitable for use on two-, three- or four-wire systems with D.P. or T.P. switches. They are made in standard capacities up to and including 200 amps. for medium-pressure systems. A typical illustration of a distribution switch panel is appended.

G.E.C. ILLUMINATING ENGINEERING PRACTICE.

A booklet being issued by the General Electric Co. Ltd. deals in an effective way with illuminating engineering practice in factories, workshops, warehouses and offices, and makes an opportune appearance in view of the E.D.A.–E.L.M.A. campaign. The booklet is intended to illustrate the methods of the General Electric Co. Ltd., in dealing with lighting problems in all spheres of industry, and contains a series of reproductions of striking photographs of installations in factories and offices, all taken by artificial light. Some diagrams illustrating the influence of better lighting on production are also included.

"J. K. W." SOLID-CONTACT LAMPHOLDERS.

These familiar lampholders are illustrated in a booklet issued by the "J. K. W." Manufacturing Co. The chief feature of this device, to which we have previously drawn attention, is that there are no small springs in the plungers, the contacts being in one solid piece. The spring which maintains contact is fixed in the top of the case away from all live parts, and its situation allows of its being made in a strong and substantial form. Thus, whilst there are no frail plunger springs, there is no departure in wiring for appearance.

WOODFYT SALES LTD.
NEW ADDRESS.

We are asked to mention that Messrs. Woodfyt Sales Ltd. have removed their showrooms to No. 10A, Newman Street, London, W.1.

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